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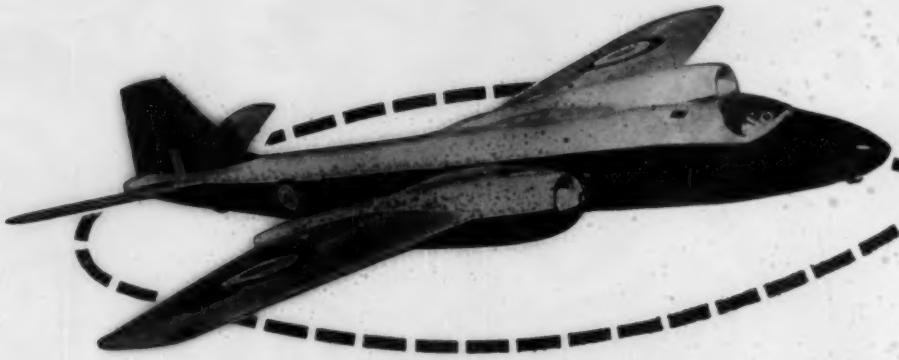

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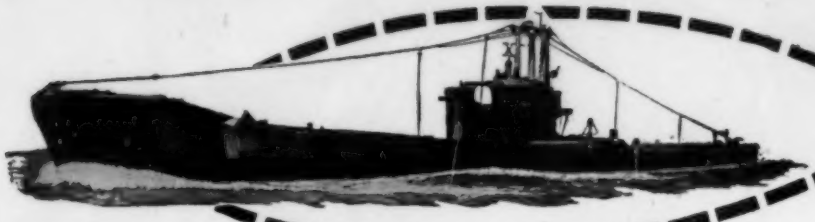

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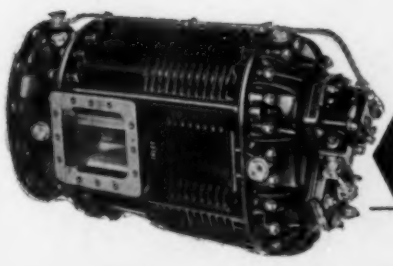

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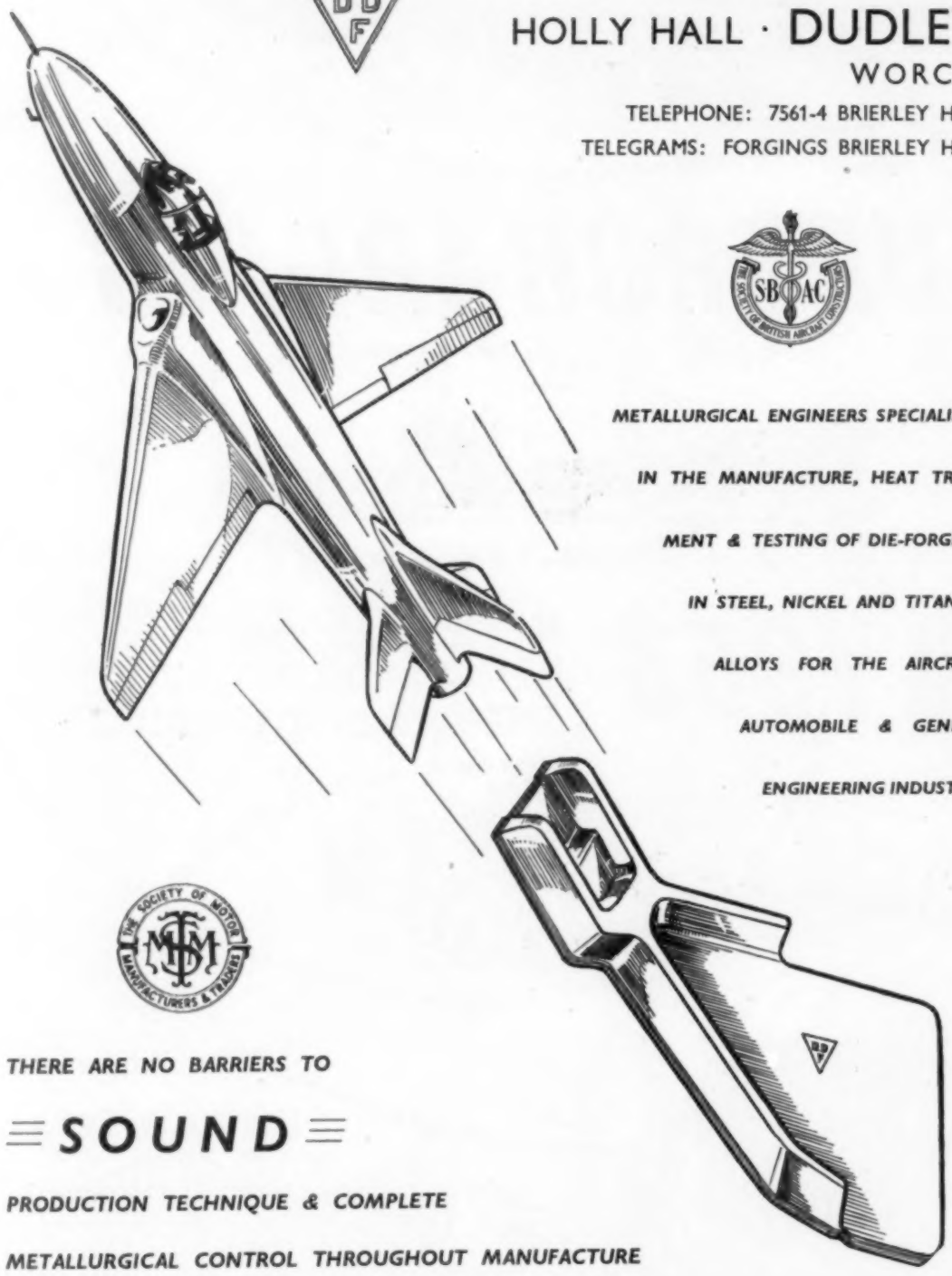

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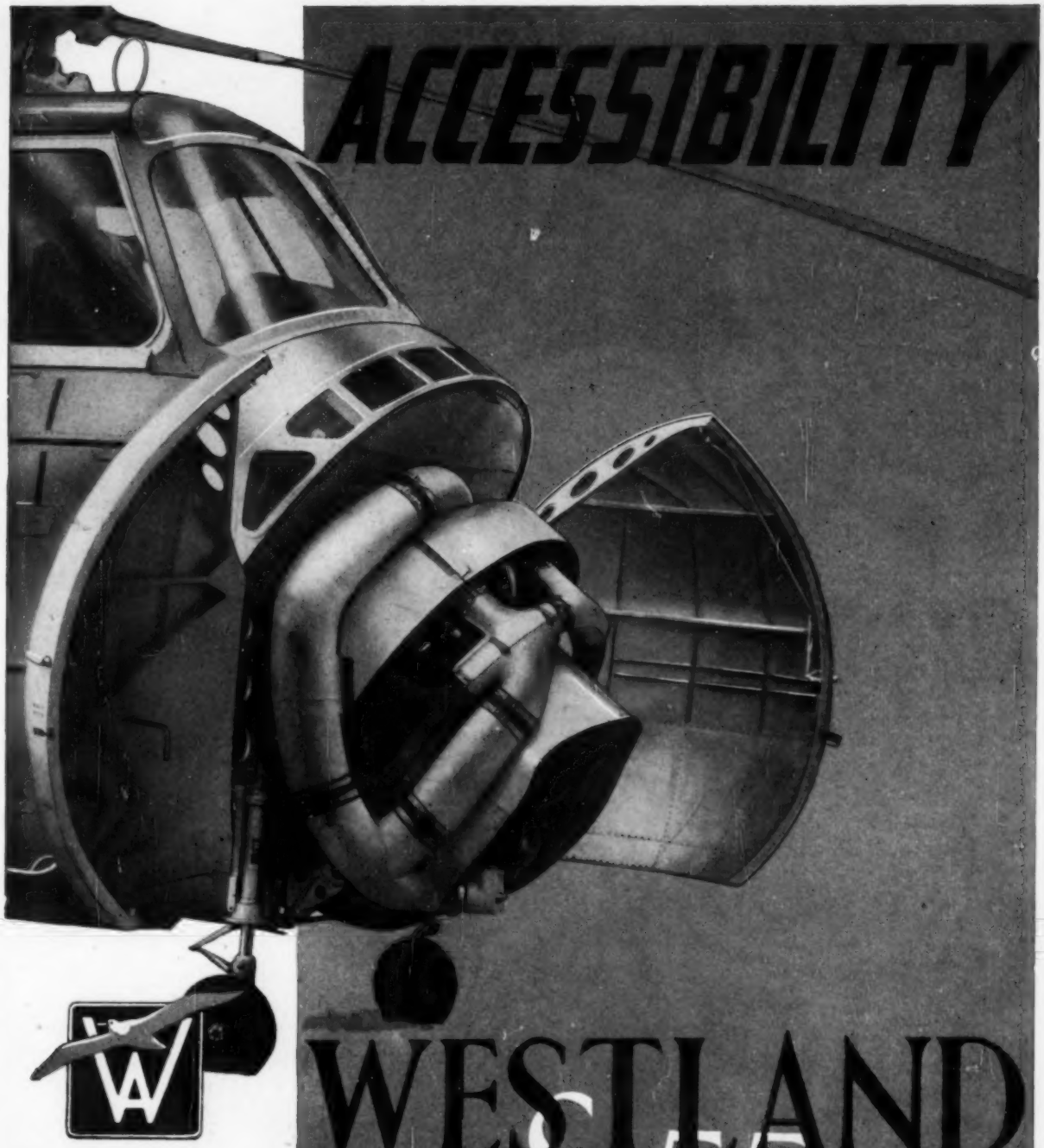

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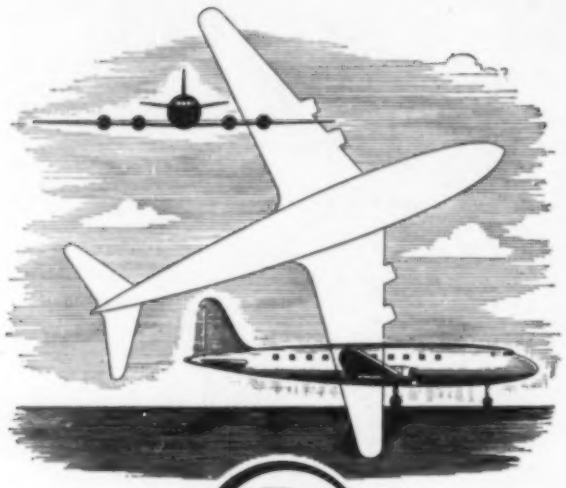

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10X/4350	10X/6150	10X/6683	110X/6650
10X/4455	10X/6154.44	10X/6683.3	110X/6661.1
10X/4475	10X/6154.5	10X/6694.44	110X/6780
10X/4540	10X/6165.5	10X/6694.5	110X/6861.11
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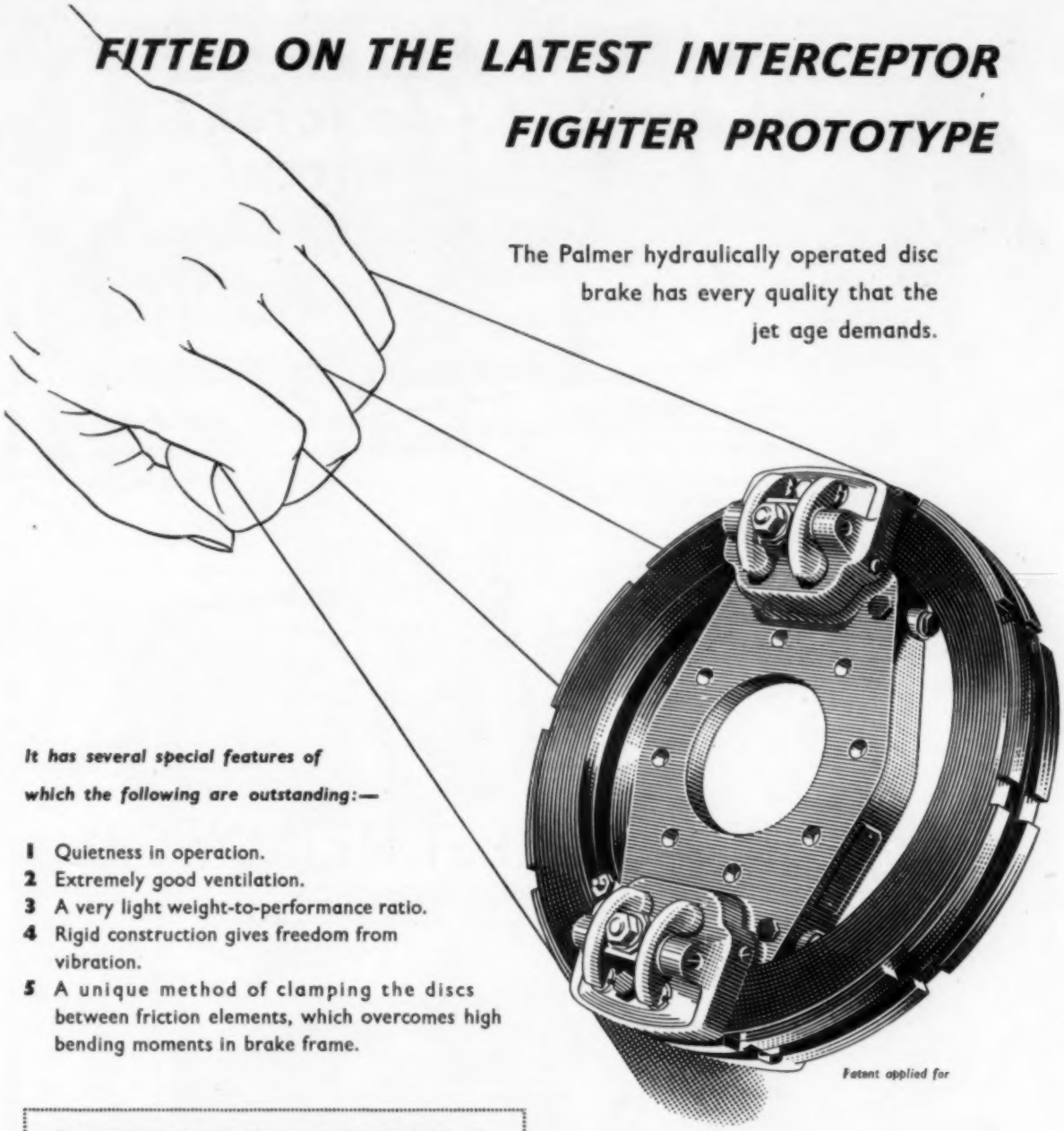

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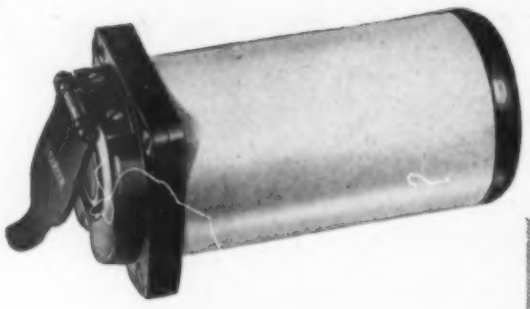

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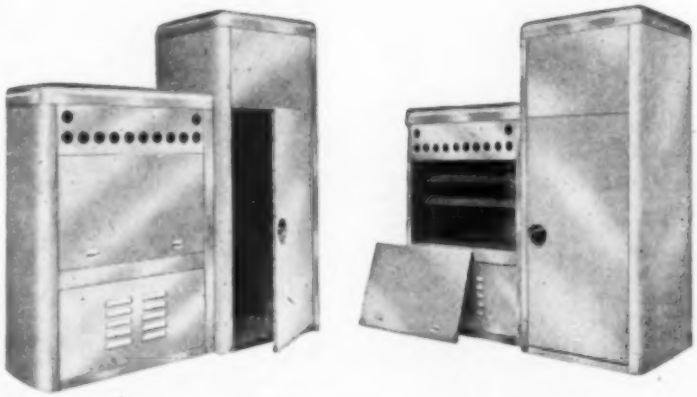

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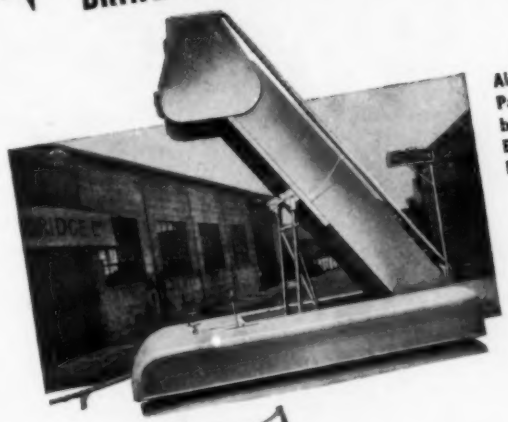
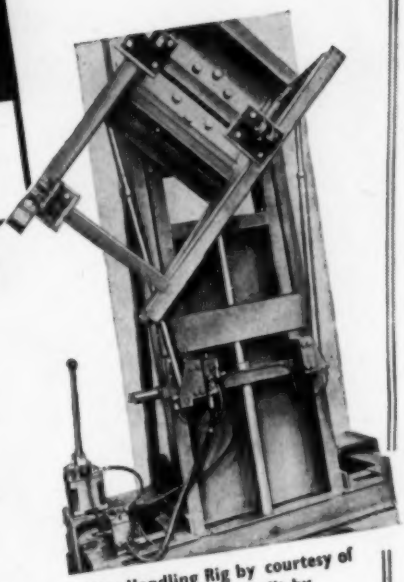
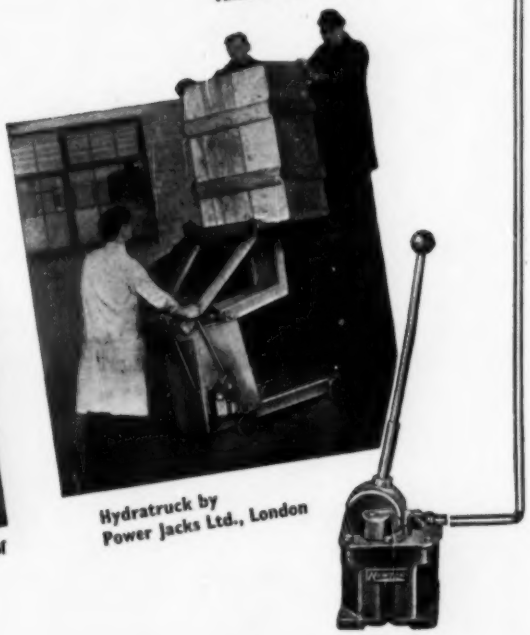


Aircraft Passenger Gangway by courtesy of B. F. Collingridge Ltd. Feltham, Middlesex



Wing Handling Rig by courtesy of Folland Aircraft Ltd. Built by Talbot-Ponsonby Ltd.

Aircraft Servicing Platform by courtesy of Charles Hill and Son Ltd., Bristol



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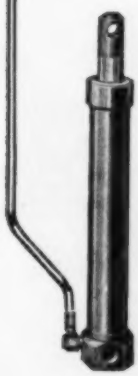

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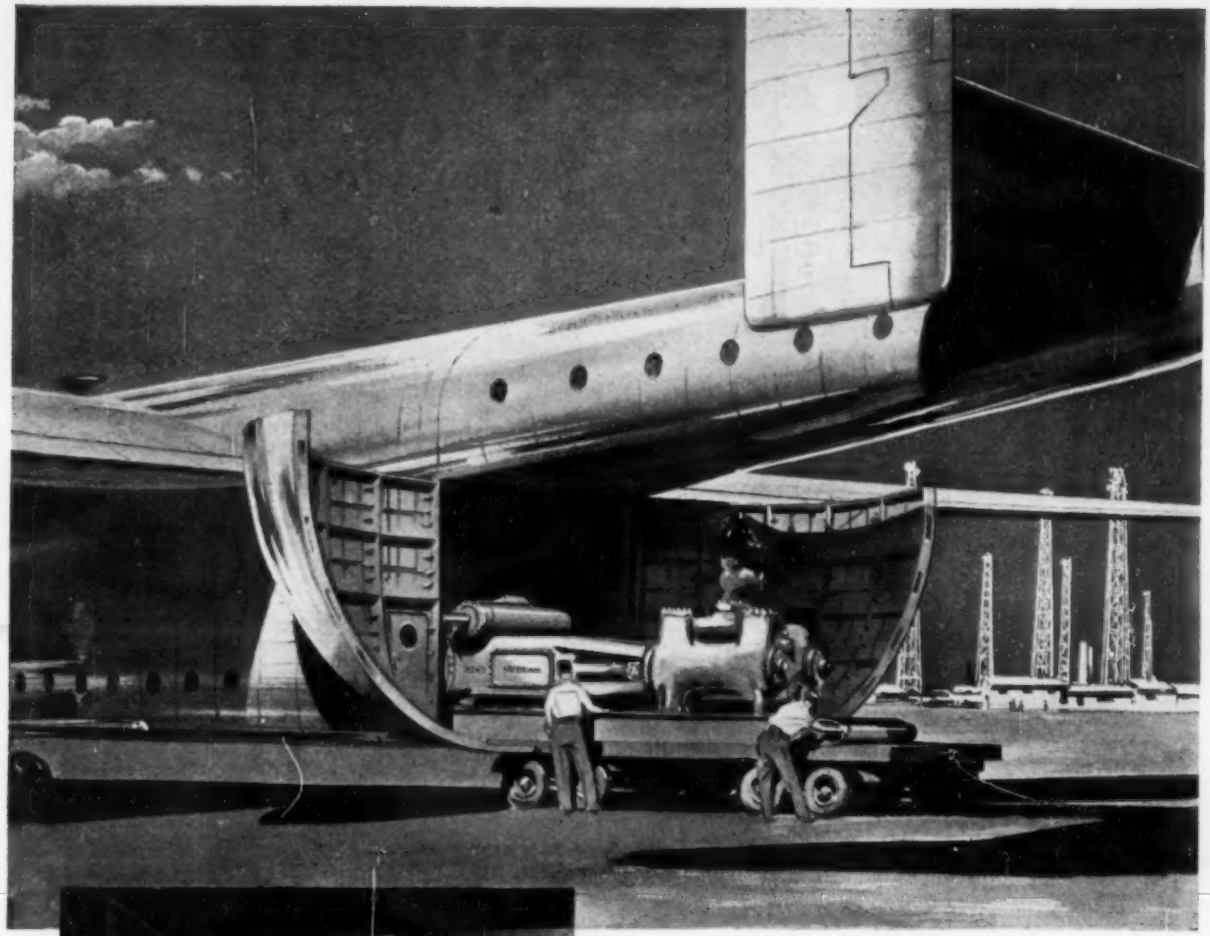

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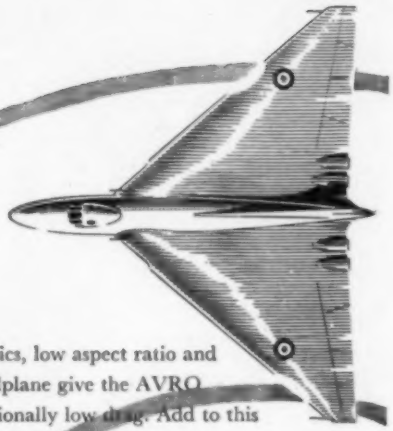

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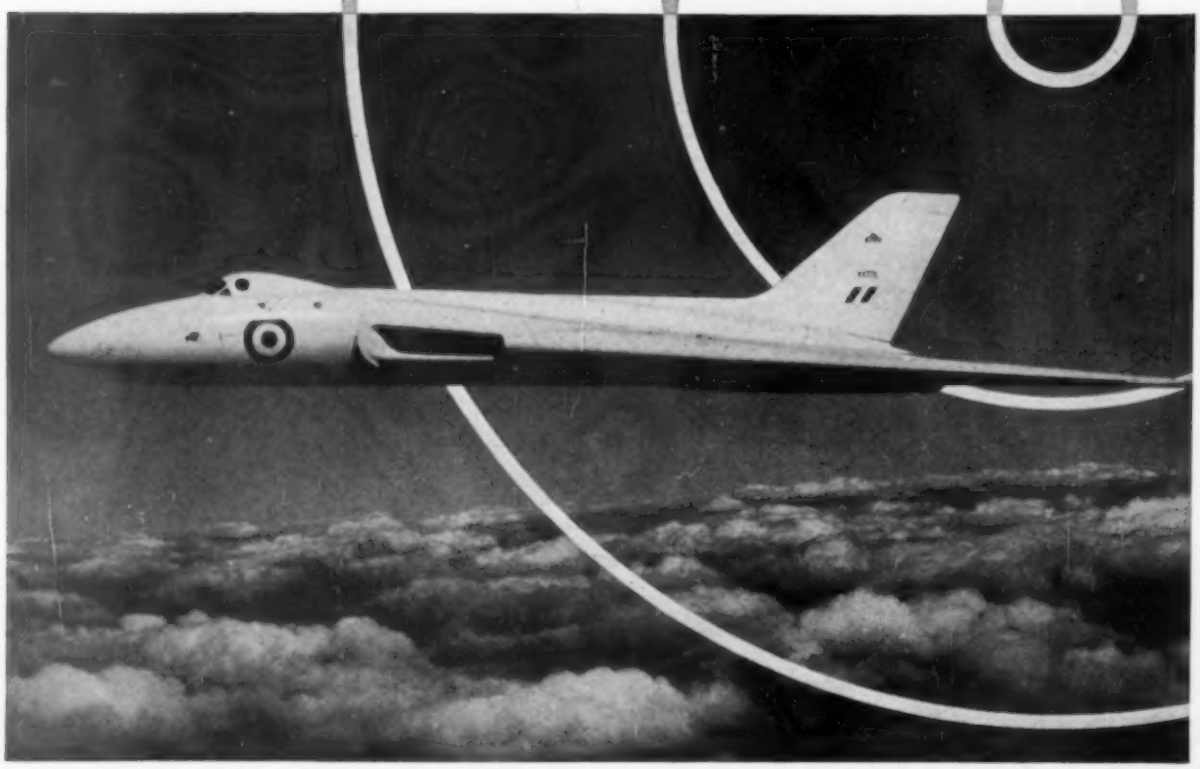

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In the Cockpit

IF it were possible to find an aeronautical engineer without any knowledge of, or preconceived ideas about, controls, what sort of pedals, levers, wheels or other devices would he now put in the cockpit of a modern aircraft for the pilot to operate? It may be that they would not differ greatly from those employed today, the man and the three planes of control being the same as always; but, in any case, would they be of the same size and shape?

In the earliest days of flying many variations were tried. The action and effect of wing-warping was, from the pilot's point of view, much the same as that of aileron operation. Early, the Wrights used two fore-and-aft sticks, both hands being full in every sense. The right hand operated the "elevation rudder" in the natural sense. Among several other systems devised and patented by the Wrights was the familiar joystick for the use of which—unlike others—the British Government paid a considerable sum during the first war. Blériot used a very similar instinctive system and the wheel associated with his "cloche" universal-joint mounting was in fact little more than a decoration on the top of the stick. Curtiss and Bréguet were early wheel men, but the former operated his rudder by a shoulder control or yoke, the pilot "naturally" leaning *away* from the low wing and so righting the machine. Bréguet's wheel was, in effect, a rudder control mounted on a joystick. Early rudder pedals did not always operate in the same sense as those of today. The first wheel controls similar in type and action to the kind in use today were probably to be found on an early tandem dual Deperdussin.

So much for the early days. But when flying started to become a real art and test pilots were employed to improve the breed, the feel of controls became appreciated, speed ranges increased rapidly and, in no time it seemed, we were involved in stick-forces per g and other complications.

Convention is now firmly dug in so far as cockpit controls are concerned, and the advent of power-operated controls, flying tails and artificial feel, all of which bring radical changes in control requirements, have made little impression. Admittedly two buttons on the stick or wheel are used for up-and-down tail trim in place of elevator control on several high-speed moving-tailplane aircraft today. It is also customary to fly large aircraft on the autopilot trimmers when changes in direction and height are required. Readers may recall, incidentally, that the largest roadable vehicle shown to the Queen at the R.A.F. Royal Review, namely, a thirty-ton, 32 m.p.h. Le Tourneau scraper, has no steering wheel but is directed solely by a small electric switch moving transversely in the natural sense. The driver told us that he quickly got used to manœuvring his massive vehicle without a steering wheel.

We feel there is now much to be said for reconsideration of the size, positioning, and shape of cockpit controls in order to find out whether improvements can be made for future high-speed aircraft—particularly the larger ones. It may be a sign that at least one Vulcan bomber is, according to reports, flown with the aid of a stick of fighter type and dimensions.

With power operation and artificial or no feel, is it good practice to carry extra weight, to encumber the pilots, and to obscure their instruments with control wheels of a type and size directly descended from the bulky affairs required on early flying-boats and bombers? Stick forces and sensitivity can be, and in some cases already are, adjustable in the cockpit according to conditions. Today we fly by brain, with very little brawn. Would not controls somewhere midway in size between those of the current fighter and the trimmers of a typical autopilot serve adequately and be acceptable to aircrew? Need a stick be more than 6in long? Should it be used in conjunction with normal rudder pedals? Or might not yaw control come from twist-grip action? The fact that more and more auxiliary controls and switches are being mounted on the stick or wheel should not, we think, be allowed to influence designers to accept oversize control components to accommodate them.

At least let us not be too convention-bound or allow the existence of standard components, excellent as they are for most current and some future machines, to prevent our thinking ahead in keeping with the new forms of control surface and operation, and the changing conditions of flight.

FROM ALL QUARTERS

Aircraft Exports—£64m

THOUGH detailed figures were not available, the S.B.A.C. was able to announce on December 30th that British aircraft exports for 1953 had reached a record total of some £64 million; in 1952 the figure was £44m. Since 1950 such exports have been nearly doubled in annual value, and at the present rate of progress it will not be long before the £100m mark is reached. The rising trend was also reflected in the growth of the industry's labour force, which increased during 1953 from just over 200,000 to about 225,000.

By a coincidence, £64m is also the value of orders received by British manufacturers of turbojet and turboprop airliners; of this total, some £16m worth have already been delivered. Negotiations now in progress may ultimately bring another £100m, almost all in respect of export orders. Altogether, 15 airline operators abroad have British equipment on order.

Bedfordshire Wind Tunnels

THE announcement, in a daily newspaper on Monday last, that work has started on the outskirts of Bedford on the A.R.A. transonic wind tunnel has caused enquiries concerning the possible connection between this tunnel and the National Aeronautical Establishment, Bedford. The two units are, of course, completely separate, although the site for the industry-owned Aircraft Research Association tunnel (described in *Flight* of January 2nd, 1953) is situated only a few miles from the Government's establishment.

Jointly owned by 14 British aircraft firms, the A.R.A. tunnel (work on which in fact started in September of last year) is scheduled for completion in 1955. It is situated on the north side of Bedford, just inside the borough boundary, and adjacent to the reservoir, from which water will be drawn in large quantities for cooling purposes during the operation of the tunnel. Little more than the foundations have been completed to date, but a small staff of engineering and aerodynamic experts under Mr. Ronald Hills are working in Bedford. We hope to be able to give further technical details of the tunnel at an early date.

Impressive runway extensions are being carried out at Thurleigh, the N.A.E. airfield, as any pilot who has flown over Bedford during the last year will have realized. The main entrance to N.A.E. is at Clapham, some four miles north-west of Bedford; as the runway extension is to the east, the eventual joining of Thurleigh and Little Staughton airfields—by a six-mile runway—remains a possibility. At present, Twinwood Farm airfield, between Thurleigh and Bedford itself, is used by M.o.S. and other officials travelling by air to visit the N.A.E.

For the New Lufthansa

FOUR German pilots, destined to fly on their country's revived national airline, landed at London Airport last Monday night. They were on their way to Air Service Training, Ltd., Hamble, where they are taking refresher courses.

The pilots were accompanied by ground instructors specializing in, respectively, air-traffic control, meteorology and engineering. A *Flight* representative who met the party found that all four pilots were veteran Lufthansa captains but that none had flown since 1945—since 1940 in one case. The A.S.T. course at Hamble is intended to provide them with commercial pilots' licences, instrument ratings, R/T licences and Dakota ratings, and to acquaint them fully with modern aids and traffic procedures.

AIR MARSHAL SIR JOHN BAKER, Controller of Aircraft, Ministry of Supply, recently inspected production of the Victor and other aircraft at the Handley Page factories. With him in this group are (left to right), Sir Frederick Handley Page, Mr. D. C. Robinson (works superintendent) and G/C. R. C. M. Collard (sales manager). Sir John Baker is appointed G.B.E. in the New Year Honours (see page 55).

Dr. Albert Plesman

"CIVIL aviation has lost its Grand Old Man." This tribute by B.O.A.C.'s chairman is expressive of the deep and world-wide regret evoked in air-transport circles by the sudden death—on December 31st, at the age of 63—of Dr. Albert Plesman, president of K.L.M. Royal Dutch Airlines.

It is doubtful if any other man played so important a part in the creation and development of a major national airline. To the Dutch people Dr. Plesman was a national figure second only to their Royal Family in popular esteem.

As a lieutenant pilot in the Dutch Army Air Force, Plesman was responsible for organizing the first aviation exhibition held in Holland—in August 1919. The formation of K.L.M. on October 7th, 1919, was a direct result of this exhibition and Plesman was appointed administrator from the outset. His organizing abilities and technical knowledge ensured a leading place for K.L.M. throughout the inter-war period; one of the company's staff writes that his intuition in choosing the right type of aircraft became almost proverbial. The German occupation temporarily put a stop to his work and from May 1941 until April 1942 he was imprisoned at Scheveningen. He spent the remainder of the war working out plans for the reconstruction of K.L.M. and immediately after the liberation of eastern Holland he set off to the United States. Even before the war ended he had succeeded in buying 14 Skymasters, which were in service within a year. Today K.L.M. has over 13,500 employees and its network extends to 102 cities in 67 countries, served by a fleet of nearly 90 aircraft. The company's status as a leader in air transport is out of proportion to Holland's population, area and industrial output—a fact which is largely attributable to the president's vision and ability. In recognition of his work the University of Delft conferred upon him in 1947 the honorary degree of Doctor of Technical Science, when it was remarked that his thesis consisted of three letters—K.L.M.

Dr. Plesman.

Dr. Plesman's life was dedicated to the belief that—in his own words—"The air ocean unites all peoples," and his counsel was always sought and valued at international conferences. This devotion was not weakened by the loss of two of his three sons in flying accidents—one a Dutch Air Force pilot, the other a Constellation captain. Deep sympathy will be extended to Dr. Plesman's widow, his inseparable companion since 1915, and to K.L.M. employees.

Heating Problems Discussed

AN important modern design problem is that aircraft travelling at high speeds are subjected to heating effects from the air through which they fly. This aerodynamic or kinetic heating is caused by two closely related phenomena: first, the adiabatic compression of the air as it is brought up to the speed of the leading edges and, second, friction heating which takes place in the boundary layer as the air adjacent to the surface tends to accelerate to the flying speed the air through which the aircraft is passing.

To discuss some of the complex problems which arise from thermal conditions, the Stress Analysis group of the Institute of Physics convened a conference on Thermal Stress, due to take place at Bristol yesterday and today, January 7th and 8th. Foremost among the problems to be discussed are those due to differential temperatures causing unequal expansions, and the deterioration of material properties at elevated temperatures.

Fourteen papers are being presented at the conference, and the subject is being discussed in all aspects from design to research. Many of the papers are specifically concerned with aircraft structures and materials, gas turbine engines and high-speed flight, and we expect to publish an account of the meeting in a future issue.

The Atomic Change-over

IN accordance with the recent Order in Council, Ministerial responsibility for atomic energy passed, on January 1st, from the Minister of Supply to the Lord President of the Council. On the change taking place, Mr. Duncan Sandys, the Minister of Supply, issued the following message to all members of the staff of the Atomic Energy Organization:—

"I wish warmly to thank you for the contribution which all of you have made, individually and collectively, to the development of atomic power for both military and civil purposes.

"Together with your colleagues in America, many of you took part in the design of the first atomic bomb during the war. Since then, working on your own, you have developed, proved and brought into production, British atomic weapons of more advanced types. At the same time you have made remarkable progress in applying the forces of nuclear fission to peaceful ends, thus opening up to this and future generations an ever-expanding prospect of material betterment.

"In the whole history of mankind through the ages, there have been comparatively few discoveries of a really fundamental character. Among these will certainly rank the discovery of how to release and exploit the unbounded energy which, since the dawn of time, has remained hidden in the nucleus of the atom.

"You have a right to feel very proud of having played some part, whether great or small, in these momentous achievements."

PANHANDLER: The curious little Hiller HJ-1 (U.S. Army designation, YH-32) is now flying. Two Hiller blade-tip ramjets, each of 32-lb thrust, supply the power; rotor diameter is 23ft, all-up weight 1,200 lb and maximum speed 76 m.p.h. A small tail-rotor supplants the rotor-downwash rudder used on the tip-jet Hiller Hornet.

SIR THOMAS SOPWITH ON "THE GROUP'S" YEAR

THE British aircraft industry was often maligned in regard to matters of production, contended Sir Thomas Sopwith, C.B.E., chairman of the Hawker Siddeley Group, in his address to shareholders at the eighteenth annual general meeting on January 6th. "People tell us," he said, "that we know how to build prototypes—the finest in the world—but they say that when it comes to producing aeroplanes in quantity we fall behind the standard set in America."

This, he maintained, was not true. The Ministry of Supply, and leading American constructors themselves, agreed that the time-lag between the conception of an aeroplane and the day when it was in squadron service was about the same here as it was in the United States. In rate of production the United States had a lead, because their orders were larger and more extensive jig and tool equipment could be installed. This was a mixed blessing, as it led to a loss of flexibility for incorporating improvements and modifications. In some cases the Americans ignored modifications during construction and delivered the finished aircraft to a centre, where they could be taken apart and rebuilt. Such a procedure, which inflated the apparent rate of delivery as compared with that in the United Kingdom, would not be acceptable in this country, where modifications were built into the aircraft while they were still on the production lines.

Sir Thomas went on to plead that the production side should receive more consideration on the part of young men. "The best brains and the best apprentices," he said, "so often seem to be attracted by the glamour of research and design." Production was equally interesting, and the rewards just as attractive.

Production arrangements for the Avro Vulcan were well established, said Sir Thomas, and a considerable number of flying hours had been recorded by the two prototypes. The "new Avro dual-control delta" [Type 707C—Ed.] was now in the hands of the R.A.F. for extensive flight tests.

Referring to S/L. Neville Duke's air speed record in the Hawker Hunter, Sir Thomas said that the Group did not intend to make another attempt at the moment as all resources were being concentrated on the production drive. It was a high tribute, he said, that by far the greatest number of "off-shore" machines ordered were Hunters and Sea Hawks.

Flight development of the Mk 2 Hunter was proceeding satisfactorily, and all production of this mark would be handled by Armstrong Whitworth. The building-up of Hawker Aircraft (Blackpool) Ltd., who were sharing in Hunter production, was progressing well. At Armstrong Whitworth the transonic wind tunnel was now in full working condition, and that company's larger supersonic tunnel would be completed in a few months.

At Gloster Aircraft, Meteor production—now in its eleventh year—would fade out during the coming twelve months, when upwards of 3,000 would have been produced. Development of the Javelin prototypes continued and production was "well in hand." Avro Canada had completed its Mk 3 CF-100 contract, and production of the rocket-firing Mk 4, described by Sir Thomas as "the most heavily armed aircraft in the world," followed immediately. Avro Canada had under development "new and advanced aircraft of quite unusual characteristics and revolutionary performance."

Having referred to the aircraft division of Air Service Training as "a most valuable production unit," and to the orders for Armstrong Siddeley Sapphire, Mamba, Double Mamba, Python and Viper, Sir Thomas went on to refer to Sapphire production by the Brockworth Engineering Co., Ltd. This, he said, had assisted Armstrong Siddeley in their production programme and had helped them in concentrating their effort on general research and development. At Avro Canada, Orenda production had been maintained on schedule and very large numbers had been produced. Design was under way on "a more advanced and powerful engine."

Discussing guided weapon activities at Armstrong Whitworth, Sir Thomas said that during the year under review satisfactory results had been obtained with advanced types of weapons equipped with "electric and electronic apparatus." "As you will realize," he said, "the flight-testing of these missiles is not the easiest of tasks, and, in order to take advantage of the excellent development facilities in Australia, an organization is being established at the Woomera Rocket Range. The advance party of key personnel is already in Australia." Sir Thomas went on to forecast "with every confidence" that the company would have a major share in the design, development and production of missiles. To those who prophesied that the day of the piloted aircraft was drawing to a close he pointed out that many of the missiles now under development were designed to be fired from piloted aeroplanes.

Although aircraft and rearmament contracts had been curtailed, High Duty Alloys had already gone a long way to restablishing themselves in civil and export markets, and the company had made an outstanding contribution to the production of axial-compressor engines by the development and production of close-to-form compressor blades.

Air Service Training continued to train considerable numbers of overseas students, and the courses in marine radio and radar were attracting increasing numbers of British youth. Unfortunately a change in Air Ministry policy had led to the cancellation of all *ab initio* Service training contracts. "I view this change in Air Ministry policy," said Sir Thomas, "with grave misgivings, as it will affect the supply of pilots from our civil Corporations and airline companies. From now on only National Servicemen who are selected and sign on for regular or short-service commissions will be given the kind of flying training that is required. When they are ready to turn to civil flying they will be too old. The position is serious. It demands action, prompt and decisive, on the part of the Government."

Although work was already in progress on machines which would replace the "rising generation" of aircraft, it was essential, Sir Thomas went on, that the Government should follow a bold policy in ordering adequate quantities of types available now.

Reviewing the Group's trading results, the chairman reported that profits for the year ended July 31st, 1953, after deducting reserve for increased replacement cost of fixed assets, amounted to £5,033,744, as compared with £5,184,552 for the previous year. Turning to the consolidated balance-sheet he pointed out that, after the provision of £1,775,551 for depreciation, fixed assets showed an increase of nearly £8 million. The board was recommending a final dividend of 9 per cent, less tax, making, with the interim dividend already paid, a total dividend for the year of 15 per cent, less tax. This compared with a total distribution last year of 10 per cent, less tax.

THE NEW YEAR HONOURS

SOME OF THE RECIPIENTS (left to right): Sir James Helmore (K.C.B.), Mr. N. C. Robertson (C.M.G.), Capt. W. Baillie (O.B.E.), Mr. St. J. de H. Elstub (C.B.E.), Capt. T. H. Farnsworth (Queen's Commendation), Mr. R. P. Pedley (M.B.E.).

IN the New Year Honours List are the names of a number of civilian recipients engaged in various branches of aviation (awards to Air Force personnel are listed on page 55), but senior members of the industry are noticeably fewer than in previous Lists.

It will be noticed from the names below that among those who receive knighthoods is Mr. W. C. Puckey, lately Deputy Controller of Supplies (Air), Ministry of Supply, while a similar honour goes to Mr. L. J. Wackett; it is included in the list for the Commonwealth of Australia, where, as manager of Commonwealth Aircraft Corporation, he has played an important part in the production of Australian-built Sabres.

Mr. E. B. Maufe, who receives a knighthood in recognition of his services to the Imperial War Graves Commission, was the architect of the R.A.F. Memorial at Runnymede. Col. W. C. Fenton, also knighted, is managing director of the British Belting and Asbestos Co., Ltd.

Appointed C.B.E. is Mr. M. D. N. Wyatt, who is chairman of Airwork, Ltd.

Among airline personnel honoured is Capt. W. Baillie of B.E.A., who has flown members of the Royal Family, and the Prime Minister, on a number of journeys across Europe, and who captained the Viscount in the New Zealand Race. Another is Capt. T. H. Farnsworth of B.O.A.C., who has development-flown every type of B.O.A.C. or I.A.L. aircraft (except the Flamingo) since 1936; he was recently awarded the new Gold Medal of the British Air Line Pilots' Association in recognition of his many services to that organization. Capt. Baillie becomes O.B.E. and Capt. Farnsworth receives the Queen's Commendation for Valuable Service in the Air.

Among the new M.B.E.s who are members of the aircraft industry is Mr. R. P. Pedley, of the Percival Aircraft Company's research staff.

BARONET

Lt-Cdr. Joseph Gurney Braithwaite, R.N.V.R. (retd.), Parliamentary Secretary, Ministry of Transport, 1951-53.

KNIGHTS BACHELOR

J. B. Elliot, chairman, London Transport Executive; Col. W. C. Fenton (for political and public services in Spen Valley); E. B. Maufe (for services to the Imperial War Graves Commission); W. C. Puckey, lately deputy controller of Supplies (Air), M.o.S.; L. J. Wackett (for services to the aircraft industry in Australia).

ORDER OF THE BATH

K.C.B.

Sir James R. C. Helmore, Permanent Secretary, Ministry of Supply.

C.B.

J. M. Stagg, Principal Deputy Director, Meteorological Office, Air Ministry.

ORDER OF THE BRITISH EMPIRE

K.B.E.

Cdr. S. S. C. Mitchell, R.N. (retd.), Controller of Guided Weapons and Electronics, M.o.S.; Air Marshal R. Williams, Director-General of Civil Aviation, Australia, since 1946.

C.B.E.

T. A. Barrow, lately Air Secretary, New Zealand; St. J. de H. Elstub, director, Metals Division, I.C.I.; E. W. Handley, assistant secretary, Air Ministry; H. E. Thatcher, lately assistant secretary, M.o.S.; M. D. N. Wyatt, chairman of Airwork, Ltd.

ORDER OF ST. MICHAEL AND ST. GEORGE

C.M.G.

N. C. Robertson, deputy managing director, E. K. Cole, Ltd., lately Director-General of Electronics Production, Ministry of Supply; Col. A. W. Savage, Director-General, Civil Aviation, Malaya-Borneo.

ROYAL VICTORIAN ORDER

M.V.O. (Fourth Class).—S/L. R. G. Churcher, W/C. R. C. E. Scott.

M.V.O. (Fifth Class).—F/L. E. W. Lamb.

ORDER OF THE BRITISH EMPIRE

O.B.E.

Capt. W. Baillie, chief flight captain, B.E.A.; H. Brown, superintending mechanical and electrical engineer, grade 2, A.M.; D. Carson, principal, A.M.; R. K. Cushing, principal scientific officer, M.o.S.; P. W. Johnson, Director, Civil Aviation, Control Commission, Germany; W. C. Muirhead, special director, English Steel Corporation, Ltd.; H. C. Vogt, assistant director of contracts, Air Ministry.

M.B.E.

Obs. Lt. L. S. Beaufoy, lately duty controller, No. 1 Group, Maidstone, Royal Observer Corps; D. F. Bowering, senior experimental officer, Met. Office, A.M.; W. H. Bowker, lately inspector in charge, A.I.D., Ministry of Supply; P. M. Carment, technical engineer, H.Q. No. 90 Group, R.A.F.; W. C. Cooper (died December 22nd, 1953, award dated December 20th), senior technical officer, M.o.S.; A. W. Dunlop, engineering superintendent, Short Brothers and Harland, Ltd.; A. bin Abdul Ghani, clerk, R.A.F. Maintenance Base, Singapore; H. F. W. Golding, chief inspector, Northern Aluminium Co., Ltd.; F. H. Green, senior executive officer, M.o.S.; H. J. Harbour, test controller, E. K. Cole, Ltd.; G. Houghton, chief technical instructor, radar section, Technical Training Col., Indian Air Force; G. J. Hughes, senior foreman, laminated dept., Bakelite, Ltd.; P. S. Kemsley, works superintendent, Gas Turbine Combustion Production Factories, Joseph Lucas, Ltd., Burnley; C. L. Kingston, insurance officer, B.O.A.C.; W. R. J. Leach, higher executive officer, Ministry of Supply; P. F. Lewindon, B.E.A. manager, Germany; F. Newell, lately senior executive officer, A.M.; C. M. Newton, chairman of committee, No. 5 (Northampton) Squadron, A.T.C.; H. W. Pawsey, higher executive officer, A.M.; R. P. Pedley, research engineer, Percival Aircraft, Ltd.; A. S. A. Pryor, senior executive officer, A.M.; J. Rix, production manager, Vosper, Ltd., Portsmouth; H. H. E. Swan, international relations officer, Australian Department of Civil Aviation.

BRITISH EMPIRE MEDAL

C. H. Brown, superintendent instructor, Class 1, No. 2 Radio School, R.A.F., Yatesbury; A. Frayne, research and experimental mechanic, R.A.E., Farnborough; F. Harvey, engineer, Tech. Grade 2, R.A.E., Farnborough; H. J. Hiatt, station warden, R.A.F., Digby; W. J. Hollis, instructor supervisor, No. 2 School of Technical Training, R.A.F., Cosford; W. O. J. Lockett, lately sub-inspector, Ministry of Civil Aviation Constabulary; I. C. MacGregor, aerodrome fire officer, Grade 1, Ministry of Transport; A. McWilliam, chief observer, Post D.2, Aberdeen, No. 29 Group, R.O.C.; T. W. Painter, mill superintendent, Swansea, I.C.I., Ltd., Metals Division; A. D. Rutland, stores superintendent, No. 7 Maintenance Unit, R.A.F., Quedgeley; G. L. Turner, chief observer, Post J.3, Beckenham, No. 1 Group, R.O.C.; L. W. Watson, head storekeeper, Ministry of Transport and Civil Aviation, Liverpool.

QUEEN'S COMMENDATIONS FOR VALUABLE SERVICE IN THE AIR

Capt. T. H. Farnsworth, senior captain, Operations Development Unit, B.O.A.C.; W. V. Greatorex, radio officer "B," B.E.A.

PRODUCTION AT BELFAST

A Visit to the Factories of Short Brothers and Harland

THE recent news that production of the Britannia is to be started in Belfast by Short Brothers and Harland has called attention to the immense production capacity of this company's Ulster factories. The work programme at present being carried out there is extensive, and includes Canberra B.2 and Comet 2 production in addition to development work on the company's own types and activity in the field of guided weapons. Seamew production for the Royal Navy is being started at the company's Altona factory, near Lisburn, one of three subsidiary plants.

The progress made by the company since its move to Belfast was completed in 1948 is indeed remarkable. This progress, and the ability to expand production easily on to a number of different types has been made possible by the large factory-space (almost two million square feet), other natural advantages, a modern layout, and adequate reserves of labour (a total of almost 9,000 people are now employed by the firm). A detailed model of the Queen's Island site and the other factories enables planning decisions, expansions and alterations to be made as they should be made—with the overall picture clearly presented on the spot. At present the main runway of the airfield is being extended to 2,000 yd, to permit its use by Comets.

The main factory at Queen's Island was the first stage of a recent *Flight* visit. This building, which has a floor space of some 600,000 sq ft, contains, among other activities, those of the well-equipped tool-room, and the very large production machine shop. Towards the far end of the building can be seen Wickman and Wadkin spar-boom millers, Canberra sub-assembly jigs, and the Canberra assembly line.

Sunderlands have not yet disappeared from the Queen's Island scene: R.A.F. and R.N.Z.A.F. machines are still being overhauled, and it is in the main factory that this work is done. Up-to-date radio and radar equipment is installed, hulls are stripped and re-skinned and floats replaced where necessary, and engines are removed and exchanged. The Comet assembly line also is planned for this building, and assembly jigs for front and rear Swift fuselages are in the process of erection there.

In the "extension factory" of almost 150,000 sq ft are contained the lofting department, sheet-metal shop, plastics department and ancillary offices. Two small Hufford stretch-forming machines (a 20-ton A.10 model and a 65-ton A.12) are among the equipment of the sheet-metal shop, but the big Model 46 Hufford of 142 tons force (able to handle sheets 5ft 6in wide) and the heavy press shop are situated on the mainland, at the Hawlmark factory at Newtownards.

The third factory at Queen's Island covers over 327,500 sq ft, and adjoins the airfield. At present, Comet sub-assembly work and final assembly are performed there, and there is associated heat-treatment and Reduxing plant. The company's first Comet will come off the line, it appears, about next June; on the occasion of our visit last month the centre-section had been attached to the fuselage of machine No. 1, work on the wings was progressing steadily, and the second and third fuselages were not far behind. The de Havilland company's rectangular network of floor tracks is employed at Belfast, too, in order to simplify sub-assembly movements.

From Sydenham airfield, Queen's Island, the company's Canberras are at present flown to Aldergrove for production test flying. The extension of the Sydenham runway, mentioned earlier, has been in progress for some time and should be completed before the first Belfast Comet is produced.

A few miles from the Queen's Island base lies Short's Castlereagh factory, housed in an impressive modern building, originally built to hold Belfast's "Festival of Britain" exhibition. Here is based the company's precision engineering division, a young but expanding unit which was responsible for the Short analogue computor shown at Farnborough last year. Headed by Mr. E. Lloyd Thomas, B.Sc., A.C.G.I., the division handles electronic, electro-mechanical and mathematical research problems, together with a certain amount of design and manufacture. The "plug-in" units of the company's computor have been designed for ease of production, and the second of an initial batch of ten computors was under construction at the time of our visit. Three of the machines have been ordered by Handley Page, Ltd., and three by Vickers-Armstrongs. Castlereagh contains also the apprentices' training school, and a further useful addition to the main factory's machining capacity.

Both the extension factory at Castlereagh and the Hawlmark factory were completed and brought into use during 1953. For the future, further extensions to the facilities at Queen's Island are in the planning stage.

In Short's main factory at Queen's Island (top) is housed the main production machine-shop, part of which is seen in the centre photograph. The bottom picture is of the Model 46 Hufford stretch-forming machine at the company's Hawlmark, Newtownards, factory.

HERE AND THERE

SUPERSONIC MINISTER: Probably the oldest passenger to fly at supersonic speed is France's Air Minister, M. Louis Christiaens (63). As seen, he was the occupant of the back seat of the S.O.4050 Vautour when it made one of its now commonplace dives beyond Mach 1 on December 29th. The picture also shows the canopy actuation on the two-seat first prototype.

Next Big Bang

A WASHINGTON report last week said that a B-36 crew is in training for the dropping of a hydrogen bomb next spring. The test will be made over the Pacific—presumably in the Eniwetok Atoll area.

R.Ae.C. A.G.M.

THE annual general meeting of the Royal Aero Club, when committee elections take place, is to be held at 119 Piccadilly on the evening of Wednesday, March 24th.

The Jet Gyrodyne—

FOLLOWING a long period of blade-testing on the ground test-rig, the complete Fairey Jet Gyrodyne is now making tethered flights at White Waltham. On starting-up, the tip-jet blades turn slowly under the impulse of the compressor air supply alone; when fuel is turned on and ignited they accelerate rapidly. At close quarters, they may be described as noisy, though not deafening; but the noise would not prove serious at airfields, because taxying can be done on the thrust of its two pusher propellers. Being the subject of a Ministry of Supply development contract, the machine has lost its old civil registration and now carries the serial XD759.

—and its Pilot

TESTING the Jet Gyrodyne is Mr. J. N. Dennis, who joined Faireys as rotary-wing pilot in June 1949. Previously he had been a civil test pilot at the R.A.E.; earlier still, as a flight lieutenant, he had performed similar duties there. He received training in 1944 at No. 1 Helicopter School course, Andover, after serving with the Autogiro squadron at Halton, and subsequently did research and development work at Beaulieu. He has some 800 hours on rotating-wing aircraft out of a total of more than 3,000 hours flown.

Rebecca for France

THE French Air Ministry has placed an order worth over £100,000 with a British firm—E.M.I. Factories, Ltd., of Hayes—for 100 sets of Rebecca Mk 4 medium-range homing equipment, as developed by the firm in conjunction with the M.o.S.

High-speed Helicopter?

BACK in Germany last week after 18 months in Sao Paulo, where he has been in charge of a German helicopter team working for the Brazilian Air Ministry, Prof. Heinrich Focke said that if restrictions were lifted it would not be difficult for Germany to make up lost ground in helicopter development. The professor—founder of the Focke-Wulf and Focke-Achgelis businesses—added that he was now designing long-range helicopters for speeds of over 300 m.p.h.

Transatlantic Honours

TWO Britons are honoured by the Institute of the Aeronautical Sciences. A Foreign Honorary Fellowship—America's highest aeronautical honour to a non-national, only one award of which is made each year—goes to Sir William Farren, C.B., M.B.E., F.R.S., technical director of A. V. Roe and Co., Ltd. A Fellowship is awarded to Mr. N. E. Rowe, C.B.E., B.Sc., M.I.Mech.E., F.R.Ae.S., Whit.Ex., technical director of Blackburn and General Aircraft, Ltd.; in most years only two non-Americans are elected Fellows. Both Sir William Farren and Mr. Rowe appear in photographs on page 40.

THE FAIREY JET GYRODYNE (referred to above) is seen in this artist's impression, which serves to recall of the configuration employed; two-blade tip-jet rotor, two pusher propellers, conventional tail control surfaces. A Leonides engine in the rear of the fuselage drives the propellers through gearing and also provides power for the compressor which produces air for the tip jets.

Transcontinental

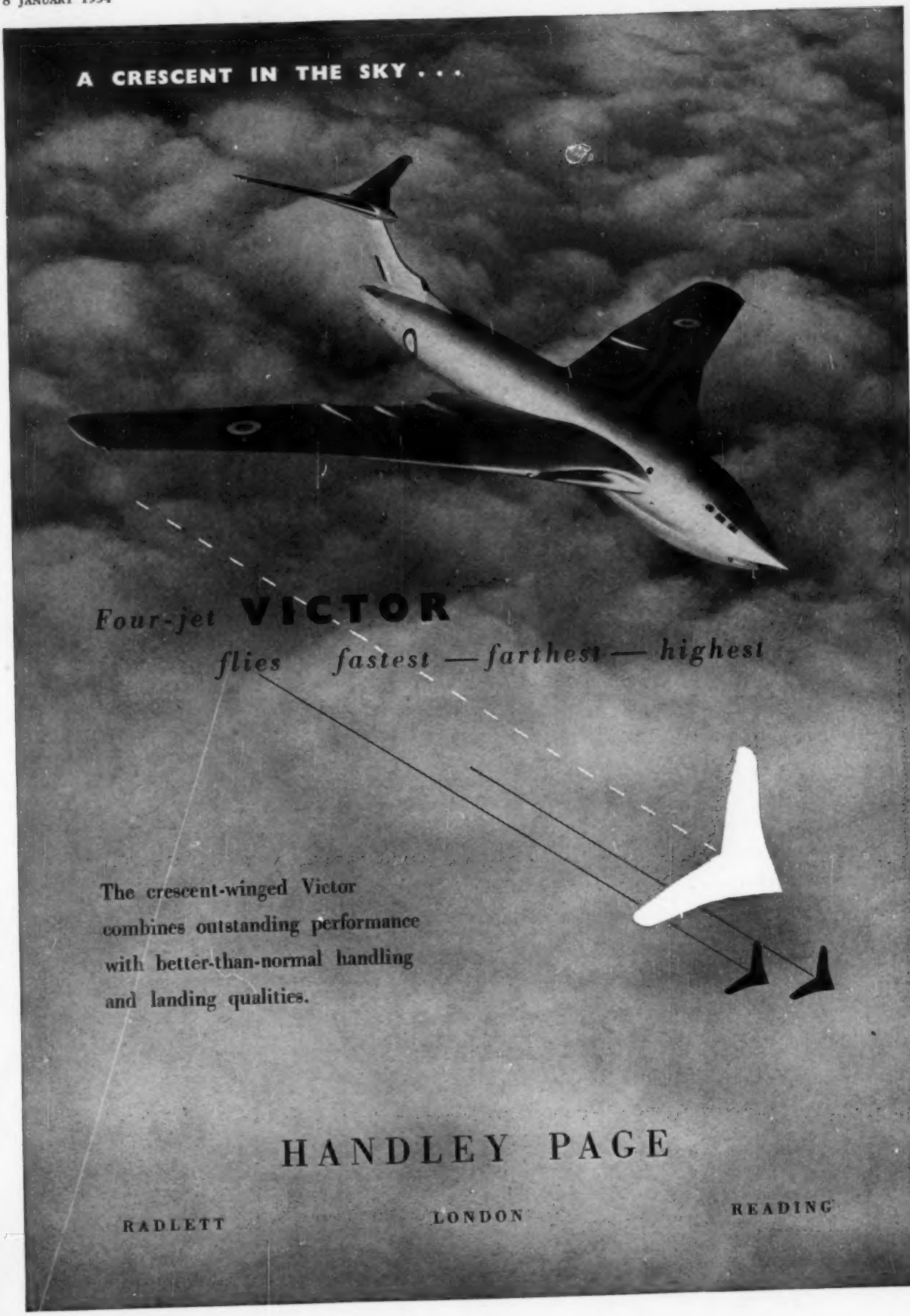
AFTER nearly eight years the 4 hr 13 min record flight across America set up in 1946 by Col. Councill in a Lockheed XP-80R has been beaten—by a mere 4 min 55 sec. The new holder is Col. W. K. Millikan, U.S.A.F., who flew his F-86F Sabre the 2,530 miles from Los Angeles in 4 hr 8 min 5 sec at an average ground-speed of 615 m.p.h. His air-speed must also have been over 600 m.p.h., for Col. Millikan experienced headwinds for much of the journey. He intended to land at the Air Force base at Hempsted, Long Island; but, running dry at 5,000ft over Brooklyn, he was forced to turn south to Idlewild International Airport, where he made a "dead-stick" landing.

Mr. R. K. Page's Appointment

IN a reference last week to the appointment of Mr. F. H. Pollicutt, lately of Folland Aircraft, Ltd., as chief designer to Percival Aircraft, Ltd., and to the move of Mr. R. K. Page from Westlands to Follands, an unfortunate confusion of company names arose. The true facts are that Mr. Page has joined Follands (not Percivals) as chief technician; he comes from Westland Aircraft, where for four years he was assistant chief designer (projects). Mr. E. N. B. Bentley has been, and remains, chief technician of Percivals.

Look, No Flap!

DURING a test flight on December 31st the Victor lost its port inner flap—a surface 10ft long by 5ft wide. S/L. Hazelden, Handley Page chief test pilot, was flying the Victor on slow-speed tests over Hertfordshire when the incident occurred. An eight-year-old boy saw "an object" fall off, and his father notified the police, who told the Radlett control. The information was radioed to the pilot, who prepared to pass low over the airfield in the hope that the damage might be identified; but as soon as he lowered his trailing-edge flaps he realized what had happened.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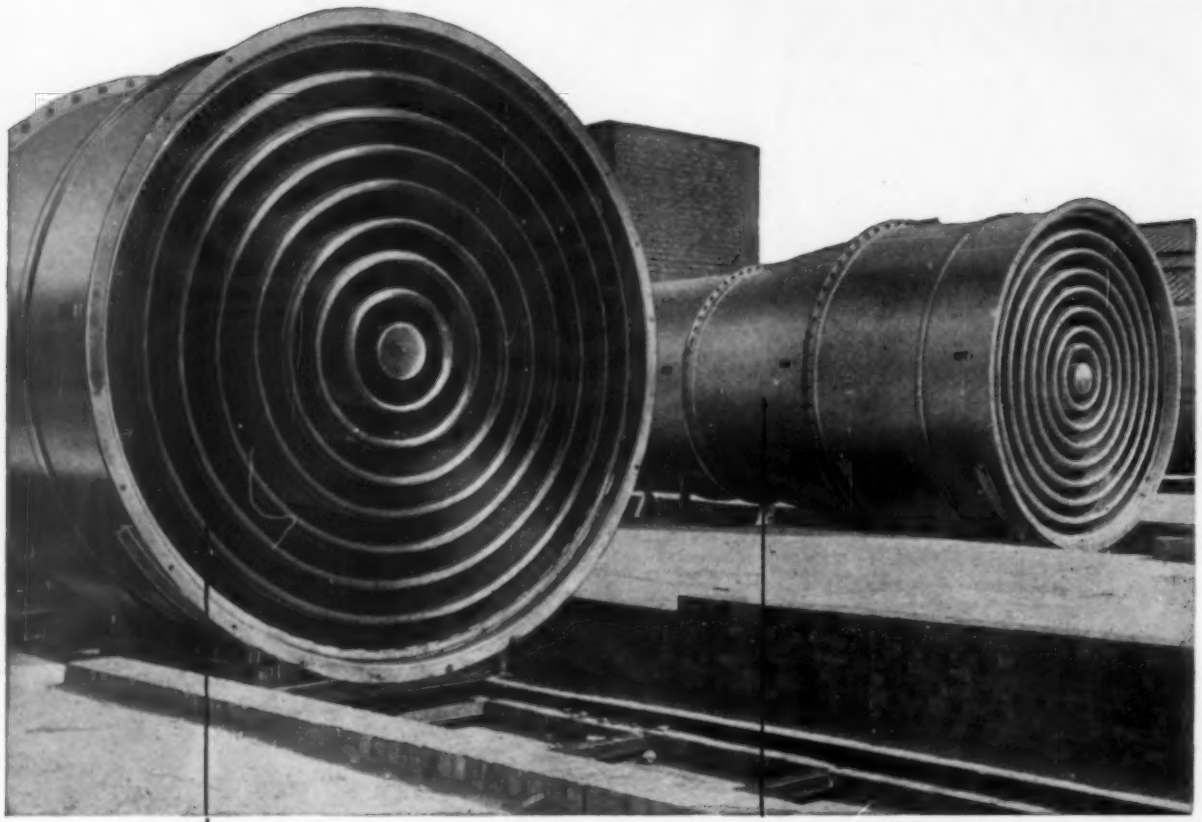

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INSTRUMENTATION by REFLECTION

A New Approach to the Design of Aircraft Instrument Panels

DURING the past forty years the number of instruments facing an aircraft pilot has increased alarmingly yet inevitably. The fact that this trend has been accompanied by increases in landing speeds and decreases in weather minima has emphasized the problem of the time factor in pilots' vision. The time taken to re-focus the eyes from instrument to visual flying, and to read and act on instrument indications—previously a comparatively short period—is now of extreme importance.

There have been many attempts to reduce "eye acrobatics" and eye travel while scanning instruments, by combination or re-positioning, and by the separation of essential flying instruments from others such as engine-monitoring instruments. One notable achievement was, of course, the R.A.F. wartime standard blind-flying panel, while recent trends have been towards the combination of several indications on one dial.

We have recently received details of a novel approach to instrument presentation put forward by Mr. O. W. Neumark, who has for some time been interested in the design of aircraft instrument panels. The basis of his suggested scheme is the principle that while the pilot is flying on instruments his eyes should be in long-range focus. Briefly, this would be achieved by the use of collimating lenses and reflectors—an extension of the reflector gun-sight principle. Although existing instruments could be viewed with advantage by this method, a marked improvement would be obtained, it is suggested, by basically re-designing the main flight and engine instruments. Details of Mr. Neumark's thesis are given below.

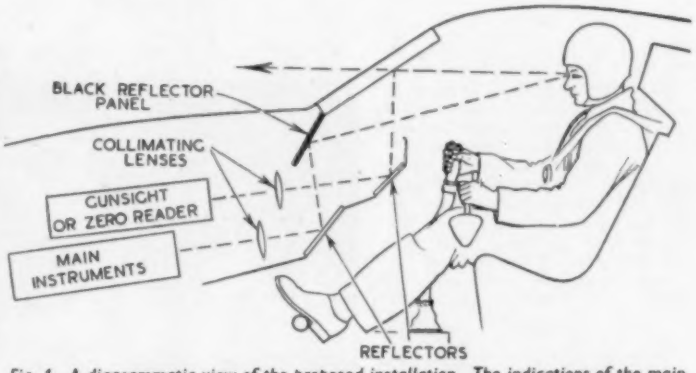


Fig. 1. A diagrammatic view of the proposed installation. The indications of the main instruments are reflected through collimating lenses on to a black reflector panel. The main advantage is that the pilot views the panel with his eyes in long-range focus; what he sees is shown in Fig. 2 overleaf.

General Principles.—The basic aims of the system are: (1) The area of instrument indications to be scanned by the pilot's eyes should be greatly reduced, eliminating the eye acrobatics necessary to scan present-day instrument layouts. (2) All instruments should be viewed with the eyes of the pilot accommodated and focused at infinity. (3) All instrument indicator movement should be capable of being seen and interpreted by wide-angle (parafoveal) vision when the image of the central instrument is in direct focus (on the *fovea centralis*). This requires that indicated movement should be rationalized, that indications and lubber lines should have a definite thickness, that interpretation should in most cases be based on indicator position (as opposed to reading an exact value), and that light-intensity coding should be used to define operating limits.

The proposed method of achieving these aims is to view the instrument through collimating lenses and reflectors, the images becoming visible to the pilot as red or orange reflections on a black panel which is effectively a continuation of the windscreen into the cockpit. Thus, the "background glare" which sometimes interferes with reflector gun-sight indications should not prove troublesome. The principle is shown diagrammatically in Fig. 1. As the image of the instrument face after passing through the collimating lens is effectively "at infinity" (the emergent light rays from the lens being parallel) no re-focusing of the pilot's eyes is necessary when viewing the panel.

As mentioned, it would be possible to view existing dial-type instruments by this method. The ideal arrangement under Mr. Neumark's scheme, however, would involve a re-designing of the main instruments. By replacing the movement of mechanical levers inside an instrument by that of optical-mirror levers (as has already been done in the miniature flight-recorders made by the French firms S.F.I.M. and Beaudouin) it is probable that instruments can be made more efficient and less delicate. To take full advantage of the optical-lever principle, the standard clock-type instrument dial would be replaced by a vertical scale along which would move a narrow beam of light. This presentation would help considerably in reducing the total area of the instrument display.

By using the proposed system, it is claimed, the psychological conflict inherent in instrument-flying training would be eliminated, for the pilot never stops looking outside the cockpit, and the subjugation of the sense of balance is made easier. "Outside" is meant only figuratively, since no binocular eye-convergence or accommodation for near vision is required when viewing the instruments.

The greatest advantage claimed for the system is that there would be no time-delay at all for refocusing one's eyes during the transition from instrument to visual flight during bad-weather approaches and landings. This delay, referred to recently by Mr. E. S. Calvert, B.Sc., the approach-lighting expert, as the final "time barrier," can be overcome only by a system such as this, or by approaching at speeds of 30-50 m.p.h. The reflector gun-sight was adopted years ago because the time required for refocusing on target, fore-sight, back-sight and target again was too long during the brief seconds available during an attack. Exactly the same principle—"indications at infinity"—will, it is claimed, eliminate almost entirely the time delay of the transition period from instrument to visual flight, and also remove many causes of present-day mid-air collisions.

Another advantage of the "instruments at infinity" concept is seen in the case of stratospheric flying, where pilots have found great difficulty in seeing and focusing their eyes on other aircraft. The images on the instrument panel will help to force the pilot's eyes to remain in long-range focus, while a further means of ensuring this would be to project in the same manner small crosses of light at intervals on to either side of the actual cockpit canopy, again to force the eyes back into focus should they become unfocused during sky searching. It is appreciated that human eyesight by itself is insufficient for stratospheric combat and must be extended by radar; nevertheless, full use of the eyes must be made, even if only to monitor automatic radar systems. Unless all indications are at infinity, exactly the same time penalty occurs in the stratosphere as is encountered during the final approach change-over from instrument to visual flying in bad weather.

A Suggested Layout.—For a hypothetical single-seat twin-jet aircraft, the instrument presentation shown in Fig. 2 is suggested as a possible layout. The central image is that of a combined artificial horizon, turn-and-slip indicator and directional gyro. The first two of these three have already been combined in the wartime Horn instrument, generally found preferable to separate dials by many pilots. To this combination is here added the indication of the directional gyro either by optical combination from a separate instrument or by mechanical combination in one instrument.

The instrument shown is based on the HL 5 or HL 6 artificial horizon, indication being "natural" as opposed to inverse sense movement. A completely "untoppleable" artificial horizon would be preferred if available. The angle-of-bank indicator of the HL 5 or 6 has been omitted here, but could be included.

The logical position for directional indications would be along a 90 deg arc at the top of the circumference of the horizon indicator or, if relative radio bearings were required, on a complete annulus around the horizon (as shown in the diagram). Radio bearing markers are reflected on to the central image and move around the annulus, there being no needle visible from the centre. The rate of turn indicator is at 12 o'clock, as in the Horn horizon. It is immediately below the heading lubber-mark of the directional indicator, which is also the central lubber-mark for the rate of turn. This is believed to be an original combination and would greatly facilitate accurate course keeping. The slip/skid indicator is at six o'clock as on the Horn horizon. It is of ball type but could, of course, be a pendulum.

The remaining instruments on the main line on either side of

INSTRUMENTATION BY REFLECTION . . .

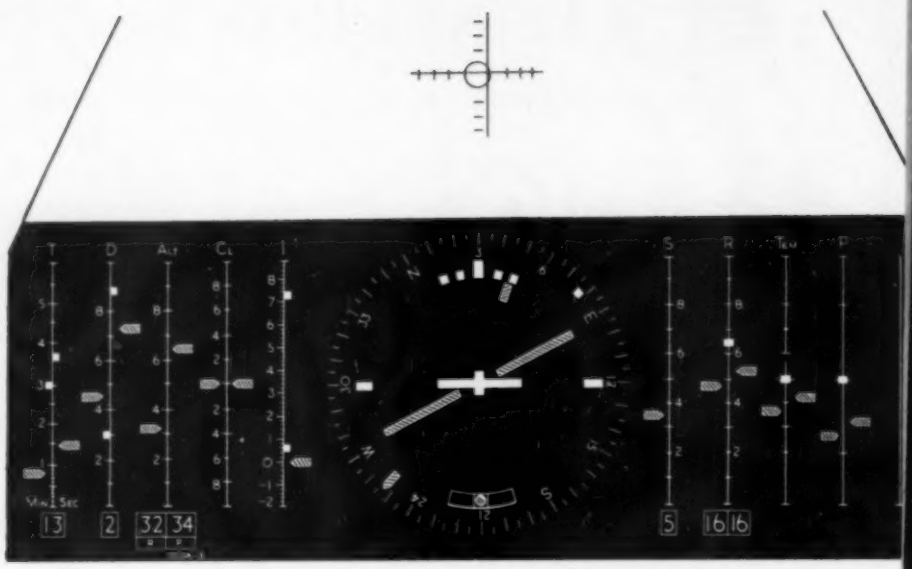


Fig. 2. The suggested instrument-presentation described in detail in the article. The central image on the black reflector panel is the combined indication of artificial horizon, turn-and-slip indicator, directional gyro and radio compass. Illumination on the black panel is orange or red, and conventional clock-type dials and pointers have been replaced by vertical scales and small beams of light (shown shaded). Lubber marks and adjustable limit marks are shown solid. On the windscreen appears the gun-sight or zero reader reflection, while other instruments and indicators could be presented below the main instrument array shown.

the central complex horizon indicate (reading from left to right):

(1) Time (hours Veeder, minutes left scale, seconds right scale).
(2) Radar range (D.M.E.) (hundreds Veeder, tens left scale, units right scale).
(3) Radio altimeter reading (left) and pressure altimeter reading (right) (thousands Veeder).
(4) Rate of climb and descent (thousands left scale, hundreds right scale).
(5) Inclinometer, or angle-of-attack indicator, with adjustable limit marks. (The indication from the artificial horizon is insufficient for certain critical conditions such as overloaded take-off and very high angles of climb.)
(6) Air speed (hundreds Veeder, tens on scale).
(7) r.p.m. (thousands Veeder, hundreds on scale, respectively left and right engines).
(8) Jet-pipe temperature (arbitrary scale, normal at centre).
(9) Oil pressure (arbitrary scale, normal at centre).
(10) Spare scale.

While one advantage of the vertical scales is their economy of space, it is true that a clock-type dial has a larger unit scale than a vertical scale equal to its diameter. High accuracy is not required over the whole of the range from zero to maximum, however, for normal operating conditions extend over only a part of this range. Thus, the use of large Veeder figures (the name by which addition-type unit counters, as in a car's "mileometer," are usually described), together with vertical scale coverage in hundreds or tens, has been adopted, and indeed seems to have much merit for many instruments.

Adjustable limit-marks can be used on the vertical scales and an adjustable heading mark on the directional indicator. The light "pointer," limit and lubber marks would be made of finite thickness, making the instruments easier to read by parafoveal vision ("out of the corner of the eye") when the pilot is looking straight ahead through the windscreen. All instruments should be visible during horizontal head-movement up to a distance equal to the diameter of the collimating lenses plus twice the distance between the pilot's eyes.

On the windscreen itself would be reflected the gun-sight, as is current practice, or a Zero Reader or comparable aid. On the main reflector panel below the main instruments listed above would appear such items as the undercarriage, flap and dive brake indicators. Another possible reflection beneath the flight instruments could be that of a map or a radar p.p.i. tube.

Concerning the light-source to be used with the vertical scales, it is suggested that if standard instruments were used they could be fitted with electric pick-offs which would rotate a cylinder having a spiral slot containing the light-source, so causing a bar of light to move up and down the scale. At its base the cylinder would contain the Veeder figures. Using the principle of the French flight recorders mentioned above, however, the optical lever principle can be introduced to replace mechanical-movement enlarging levers and chain gears. (In the French recorders, basic instrument-readings are converted to angular movement of a mirror. This directs a light spot up and down a slot on to photographic paper which moves behind it at a constant speed.)

It is possible that the layout and detail design of the proposed panel shown above may be open to criticism on various grounds, including the one that the scheme is too radical a change from what has become firmly established practice. Established practice in instrument presentation, however, is not necessarily synonymous with the ideal method. In the underlying idea of viewing instruments in "long-range focus," and in the central combined instrument, there is undoubtedly much of basic value. A detailed analysis and investigation of the scheme by the appropriate Service department or by civilian instrument firms would appear to offer extremely interesting prospects for the future.

SHUFFLE AND CUT

FOLLOWING President Eisenhower's instruction that the cost of maintaining U.S. forces abroad must be cut without reducing their efficiency, a civilian labour scheme has been introduced in the United Kingdom. Nearly 4,000 British civilians will be recruited by the Air Ministry to work at U.S.A.F. bases here, mainly as clerical and supply staff.

They will be paid by Air Ministry at the standard rates for their counterparts working with the R.A.F.—an average of £535 per year. By contrast, the cost of transporting and maintaining a corresponding American Serviceman in Britain is $4,900 (about £1,750). The £535 (about $1,498) paid by the Air Ministry will be refunded in dollars by the U.S. Government and will yield some $5,992,000 (£2,140,000) per year to the Exchequer.

The civilians will be recruited by Air Ministry through labour exchanges and between 2,000 and 2,500 will be employed at the large U.S.A.F. central depot at Burtonwood, Lancs. The remainder will work at American bomber bases in other parts of the country. Some 3,000 British civilians are already employed by the U.S.A.F. and preparations have now been made to train new arrivals.

STANDARDS FOR WORKSHOP PRACTICE

FORTY-ONE of the standards most important to engineers, draughtsmen and engineering students have been collected in the 1953 edition of *British Standards for Workshop Practice* (*B.S. Handbook No. 2: 1953*). Analogous standards have been grouped into seven sections, namely, those dealing with limits and fits; screw threads; gauges; bolts, nuts and metal-thread screws; cutting tools; machinery details; and miscellaneous data.

In the foreword, Mr. S. J. Harley, chairman of the Engineering Divisional Council of the Institution, expresses the hope that the handbook will become increasingly recognized as the standards text-book in all establishments where engineering is taught, both in industry and in the academic world. He also draws attention to the fact that the opportunity has been taken of including in this reprint several specifications, the basic data for which has received acceptance on both sides of the Atlantic, notably those standards for Unified threads and for limits and fits.

Copies of this 630-page handbook can be obtained from the British Standards Institution, 2 Park Street, London, W.1, price 21s including postage.

FIRST SPOT YOUR FISH . . .

Aircraft as an Aid to Sea Fishing: Potentialities of the Helicopter

By M. J. HARDY

AIRCRAFT, and more particularly helicopters, are now beginning to achieve some prominence as a means of extending the fisherman's range of vision, and the orders recently placed by several British and Norwegian whaling companies for Westland-Sikorsky S.55 helicopters have underlined this fact.

These orders are highly significant because, when linked with other new developments in whaling, such as the electric harpoon, they indicate a widening scope for aircraft, whether of fixed- or rotating-wing type, as an aid to spotting fish of many types and sizes. Shortage of steel, increasing costs and renewed German and Japanese competition have all made fleet replacement a financially difficult business for owners of all types of ships, so it is not surprising that in some quarters helicopters are regarded as potential successors to the whale catcher. Also, it is not only for finding whales that aircraft have been and are being used. Many other types of fish are caught with the aid of aerial spotting.

Like so many seemingly new methods, aerial fish-spotting is, in fact, surprisingly old. As far back as 1920 an aeroplane was used for this purpose in the western Atlantic menhaden* fishery, and it was apparently successful, in spite of the none-too-reliable motors of those days. In 1921, a Westland Limousine five-passenger cabin biplane, G-EARV, powered by a 450 b.h.p. Napier Lion, was sold to Mr. F. S. Cotton, of Sidcot-suit fame, for spotting with the Newfoundland sealing fleets.

Use of aircraft as a fishing aid was not, however, immediately exploited, and for a long time they were regarded as an expensive —even an eccentric—luxury which only a few wealthy fishing-boat owners could afford. During the next 25 years aircraft were employed only very occasionally, and then not for spotting, but nearly always on fishery patrol and protection, involving such duties as preventing infringement of territorial waters by foreign trawlers and searching for fishing vessels in distress. A fishery patrol service on Japan's Pacific coast before and during the war was operated by the Tokyo Aviation Co., Ltd., and the Newfoundland Government use an aircraft to prevent infringement of their territorial waters.

As fishery patrol and protection were usually undertaken by State agencies rather than by private enterprise, it is not surprising that aircraft were used for these duties more often than for actual spotting. In those days when aerial spotting had still to prove its value, chiefly before the war, boat owners were naturally reluctant to spend any of their hard-won profits in buying an aeroplane. But spotting was not entirely neglected in pre-war days; it was used in 1930-32, and has been employed regularly since 1937, in Iceland's herring fisheries, being financed and operated by fishermen on a co-operative basis. In the summer of 1940 Flugfelag Islands H.F. were given a government contract to spot herring shoals for the herring-oil factories on Iceland's north coast, and a Waco YKS biplane seaplane was employed. In 1945 Loftleidir H.F. received a similar contract, and operated a Stinson Reliant seaplane on this work. Norwegian herring fishermen also take advantage of aerial spotting to some extent.

It is not surprising that the U.S.A., with its profusion of light aeroplanes of so many types, is the most prolific employer of aircraft for fish spotting, and many of the users are Pacific North-West coast tuna fishermen. Catching certain types of fish found in schools, such as tuna, presents its own peculiar difficulties, as sufficient schools of fish—and of bait—must be found by a tuna clipper before her fuel or provisions run out. If weeks have to be spent searching for fish, and a boat returns with only a partial load, her owner makes little profit, especially if a long round trip —perhaps 5,000-6,000 miles—to the fishing grounds has to be undertaken. It is not surprising, therefore, that many of these clippers—and there are about twice as many operating as before the war—carry an aeroplane or helicopter for spotting. An aircraft can cover a far greater area in a given period of time than a masthead observer can, a larger area can be viewed at a given instant, and height can be altered to make sub-surface shoals more easily visible, and to ensure their accurate identification.

In 1947, the American Tunaboat Association experimented with a Bell 47 helicopter fitted with nylon pontoon floats instead of wheels, and flying from the clipper *American Lady*. The canopy over the ship's bait tank, in which bait is kept when caught, was used for taking off and landing. This experiment was successful, take-offs and landings being made without difficulty even in rough seas. A Hiller Model 360 operates from the Van Camp Sea Food Company's clipper *Esperito Santo*, likewise being fitted with nylon floats and using the ship's tank canopy for landing. Sikorsky S.51s have been operated from fishing boats by the Royal Canadian Air Force. A full-load range of 170 miles (Bell 47) or 130 miles (Hiller 360) shows what a greatly increased radius of search a helicopter can offer its parent ship.

Although helicopters have proved successful for tuna spotting, their comparatively high initial and operating cost have made them less popular for this purpose than single-engine floatplanes. Several of these are used by tuna clippers, landing and taking off from alongside their parent ships and being hoisted inboard by a derrick. First tuna clipper to carry a seaplane was named *Liberator*—she was later sunk in a collision—and several boats owned by Van Camp Sea Food (*White Star, Corsair, American Beauty* and *Chicken-of-the-Sea*) carry Luscombe Model 8 Silvaire floatplanes. With a cruising speed of just over 100 m.p.h. this type has a cruising range of 350 miles. Several other Southern California tuna clippers carry a seaplane. A Piper Super Cub is carried by the clipper *Senibua*, which operates in Australasian waters, and is believed to be the smallest ship of this type to carry an aircraft; the Cub is kept, with wings removed, on top of the bait tanks.

Besides tuna clippers other types of fishing vessels carry seaplanes. Although a purse seiner is similar to but smaller than a long-range tuna clipper, and has less deck space, at least one has been so equipped. This was *Vindicator*, owned by P. Martin and J. Rados; she carried a Piper Cub seaplane on the main deck, but there was insufficient space to stow it satisfactorily, and its use was discontinued after a short time, although it had been found valuable for spotting.

Sardine spotting, too, has been successfully carried out from the air; the method was pioneered in 1946 by Van Camp's, who operated an aeroplane from Astoria, Oregon. This was land-based, and so operations were limited to a relatively short distance offshore. Late in 1947 this enterprising firm chartered an airship to find out if lighter-than-air craft could be used successfully and economically for fish spotting; but it was too slow, required too large a crew and proved too expensive to justify the results achieved. The same company now operate a Republic Seabee, a Navion and a two-motor amphibian for sardine spotting. These aircraft are shore-based and operate on moonlight nights, when fish can be located by their phosphorescence. Land-based air-

This view of a whale factory ship, with a catch floating astern—it was shown at Mr. A. E. Bristow's recent Helicopter Association lecture on air whaling—gives the pilot's view of a helicopter flight-deck.

**A fish of the herring family, valued for its oil.*

FIRST SPOT YOUR FISH . . .

craft have been used for keeping track of pilchards off the U.S. Pacific coast. Flying from Southern California, they spot by day and the fishing is done at night.

Another Californian sardine-fleet operator employing seaplanes extensively is the French Sardine Co., whose *Scarlet Queen* carries a Cessna floatplane; it was at first stowed just aft of her funnel, but is now carried on a modified bait-tank canopy. Luscombe Silvaire floatplanes are carried by *Paramount*, *Navigator* and *Normandie*, also of the French Sardine Co.

Expense is naturally the chief objection of many operators of small fishing boats to buying an aircraft, but this problem can be largely overcome by sharing the cost of chartering an aircraft among several owners, as has been done in Iceland and in the pilchard fisheries of America's Pacific coast. During the 1949 season, a Piper Cub was successfully employed in spotting menhaden for 18 fishing boats. Flying usually at 1,000ft, the pilot was able to see shoals several miles away, and to detect fish which, 20ft below the surface, would have been invisible from a ship. Other fish besides menhaden surface in shoals, and it is often possible for a trained aerial observer to determine their species by the colours in the shoals. Thus one or more aircraft can offer a complete scouting service to fishing fleets at a fraction of the cost of equipping each boat with an aeroplane.

Owners of whaling fleets—each of which consists of a large factory ship and several catcher boats—are naturally not so affected by expense considerations when choosing aircraft for spotting. Since the war, increasing use has been made of them, especially as a factory ship can provide sufficient deck space for a hangar. In 1946, the 15,000-gross-ton *Balaena* was completed for United Whalers, Ltd., and was at that time the world's most up-to-date factory ship, being unique in employing three Walrus amphibians for whale spotting, ice reconnaissance and weather reporting.*

Also quick to appreciate the advantages of aerial spotting was the Netherlands Whaling Co., whose 10,409-gross-ton *William Barendsz* carried two radar-equipped Walruses.

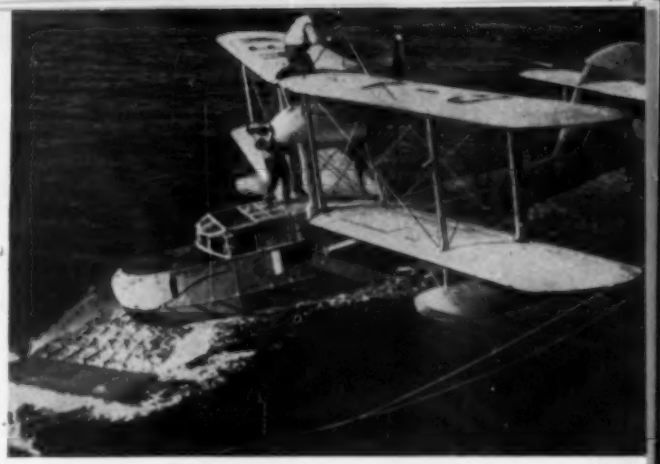
On *Balaena's* first Antarctic trip, two Walruses were kept in a commodious hangar at the after end of the boat deck; the third was left at Cape Town as a spare. Launching was carried out by a catapult—once fitted in H.M.S. *Pegasus*—which could be used for port or starboard launching. Hoisting-in after landing was done by a large crane. Each Walrus was kept in constant touch with *Balaena* by W/T or radar, and carried a crew of three (pilot, navigator and radio operator), who were provided with a covered-in dinghy, a lightweight tent and the latest naval immersion suits as survival equipment. Extra fuel tanks were carried on underwing racks. To find whales, the pilots first looked for the tinted water denoting the shrimp shoals on which whales feed.

After operating these Walruses satisfactorily for the 1946-47 season, it became necessary to increase *Balaena's* crew accommodation, and the hangar was modified for this purpose. The Walruses were sold because, although offering many advantages, they required a great deal of hangar and deck space, and were found to be cumbersome to handle, besides having a rather limited range. But this pioneer attempt was to bear fruit, because other whaling-fleet owners began to realize its potentialities, and there are several who now take advantage of them. A Westland-Sikorsky S.51, LN-ORG, has been flown since the 1952-53 season from Melsom and Melsom's factory ship *Norvhal*, by Mr. A. E. Bristow, well known as a helicopter pilot, and who has recently formed a company, Air Whaling, Ltd., to consult, advise and specialize in the use of aircraft for whaling. Mr. J. Kirkhorn, a Norwegian, acts as assistant pilot, and two ground crew are employed. Nylon rubber floats are fitted to this S.51, and radio is used to guide catcher boats to the kill. A special flight deck has been constructed on *Norvhal's* poop, with an all-metal hangar built partly between and behind the twin, side-by-side funnels. This deck is self-contained and has special fuel-storage tanks. More than 8,000 gallons of aircraft fuel were taken on board *Norvhal* at Durban before she left for the whaling grounds.

Norvhal is by no means unique among factory ships in carrying a helicopter, as the German-operated *Olympic Challenger* also has one; though this ship is not operating during the present whaling season. Another Norwegian vessel, *Thorshavet*, owned by A/S. Thor Dahl, carries a Hillyer UH-12A, LN-ORH, and the Japanese Taiyo Fisheries Company's 17,000-ton factory ship *Nisshin Maru* is using a helicopter this season.

Use of rotating-wing aircraft by whaling fleets is bound to increase in future, because the helicopter has now proved its value as a spotter sufficiently to make whaling-fleet owners more eager to exploit its considerable versatility. Besides being able to operate in weather too bad for a catcher boat, it can assist in navigation and, if necessary, in rescue work.

**An article on these operations, by Mr. John Grierson (who was in charge of them) appeared in "Flight" of July 10th, 1947.—Ed.*



How the Walrus amphibians used in 1946-47 by United Whalers, Ltd., were recovered after a spotting flight. The factory ship turned to make a smooth-water "slick," across which the aircraft was taxied onto a floating net. A hook on the keel engaged the meshes, and the net was then hauled alongside so that the aircraft could be hoisted aboard.

There is no reason why killing the whale as well as spotting it should not eventually become part of a helicopter's duties. A new electric harpoon has been developed by the General Electric Co., Ltd., and is undergoing trials this season in Antarctic waters from the catcher *Setter V*. Relying on electric shock for killing, instead of on the explosive charge usually employed, this harpoon is fired from a gun weighing 1,700 lb. In theory, therefore, it could be mounted in an S.55, disposable load of which is 2,720 lb; but, obviously, something smaller and lighter would have to be developed for aerial harpooning. Small oxygen bombs would be attached to each harpoon to keep a whale afloat after it was killed, and marking dead ones with a flag can also be done from the air. It has been found that, whereas a catcher which kills one whale will often scare off the rest of the school, they are not disturbed by aircraft.

With these advantages, therefore, it is not surprising that a fixed- or rotating-wing aircraft is worth the equivalent of three or four whale catchers. In a recent season, the extra catch credited to the use of a helicopter by one particular vessel would have repaid the first cost of the aircraft about ten times over. Since five smaller helicopters, such as S.51s, or two larger ones, such as S.55s, can be bought for the price of one catcher boat, a brisk demand from whaling fleet owners may follow in future.

A helicopter can perform almost every task that a whale catcher can—except, of course, that of towing back dead whales to the factory ship for processing—so existing catcher fleets could be considerably reduced in size. A typical whaling expedition consists of a factory ship and twelve or more catchers, which hunt in a wide arc around their parent ship, covering some 50-100 miles ahead of her. In future this may be reduced to two or three catchers and two or three helicopters. Replacement of catcher boats by aircraft is obviously advantageous for an owner, as a helicopter's crew of one or two pilots (and, perhaps, in future, a harpoon gunner) plus two or three ground engineers, would be much smaller than that of a catcher, and a greatly reduced wage bill would result.

So the orders recently placed for S.55s by British and Norwegian whaling-fleet operators have set a seal of approval on the helicopter's past performances, even though its effectiveness has until now been hampered slightly by small carrying capacity and restricted range. As the only really large helicopter in production in Europe for civil users as well as military, the S.55 is naturally of interest to catcher owners. Features which should attract them are its hydraulic hoist, and its range of 400 miles in still air, with a 20-minute fuel reserve. The cabin, of 340 cu ft capacity, is 10ft long by 5ft 6in wide by 6ft high, and in this space three 100-U.S. gallon long-range fuel tanks can be fitted. Alternatively, a lightweight harpoon gun might be mounted so as to fire through the opening provided by the 4ft × 3ft sliding door on the starboard side. A helicopter's great manœuvrability and versatility would make harpooning a much easier task than at present, especially as a stable firing platform could be provided in rough seas—at any rate, far more stable than the heaving fo'c'sle of a catcher boat.

Whaling experts believe that helicopters will soon become standard equipment on factory ships, flying off a turntable flight deck. As many as six or eight have been suggested as the fleet to be carried on a single factory ship, but it is unlikely that more than three will be accommodated—or needed. Aircraft could also be carried on catchers themselves, this method being employed by Balleneros Ld. S.A., who operate two Piaggio P.136 amphibians in Antarctic waters, one being carried by their s.s. *Olympic Winner*. It is likely, however, that helicopters will continue to be preferred to flying-boats and seaplanes, as the latter are more likely to be prevented from taking off by bad weather, and they generally take up more deck space.

PRODUCING THOSE AIRLINE PILOTS

A Third Contribution on a Thorny Subject

By DAVID MEAGER

IN our issue of October 16th last, Captain David Brice examined the problem of recruiting and training airline pilots in the years to come, and on November 6th his views were challenged in an article by a serving R.A.F. officer. In the present article a third proponent—one with considerable experience both as a Service and as a civil pilot—studies the question from some new angles, and outlines his own scheme. Aspects of the subject were discussed in our leading article last week.

THE problem of future pilot training, vital as it is, would not seem to have been brought appreciably nearer to solution as a result of the recent contributions of Captain Brice and John Bishop. As an experienced airline captain himself, the former is certainly well qualified to state what is required of the fully-trained pilot; but, to say the least of it, he seems more than a little shaky in his suggestions as to how this aim may be achieved. Mr. Bishop, on the other hand, stoutly (and, it would seem, with some justification) resolved to defend the Service and its pilots, is nevertheless unable to offer any constructive counter-suggestions. In fairness to Captain Brice it must be said that he has obviously been influenced by the conviction that any more ambitious training scheme would be immediately frowned upon by the parties responsible for footing the bill. If this is indeed the case, then here is one potential airline passenger who will keep both feet firmly on the ground in the future.

In the first place it will surely be agreed that the would-be captain of an airliner—unhesitating in his decision to fly on meteorological grounds, fully appreciating the limitations of his aircraft, etc., etc.—must be taught to fly. A grudging twenty or thirty hours on Austers, sandwiched between thick slices of Link and Dehmel, with geography, history and languages thrown in, to be followed by a little more "specialized" flying to obtain a Commercial Licence, and an uncertain training programme as airborne cabin-boy—these would hardly seem to be the answer. Most certainly synthetic training will be essential, as will the other subjects mentioned; but so, too, will a carefully planned and supervised flying programme at this all-important *ab initio* stage.

This, surely, is the time when lasting impressions are formed, the seeds of bad habits sown (if not checked) and, most important of all, when skilled tuition and example can instil lasting confidence in a lad's mind when coping with the behaviour of a comparatively strange mechanical contrivance in a completely strange medium. As Mr. Bishop says, the youth of today will learn, and learn fast—the only trouble being that if he is not taught he will find out for himself; which can, of course, be a very different matter.

After all, we are dealing here with a boy of eighteen or nineteen with, it is to be devoutly hoped, a certain amount of spirit. Even though he may be fully capable of developing into a first-class airline pilot, given time and the right training, it is rather a lot to expect him to appreciate and enthuse upon the lasting value of so much synthetic and ground training when he wants to fly. Spinning, aerobatics and the like may not be required of an airline pilot in his professional capacity—certainly one shudders to contemplate a Stratocruiser grinding its way over the top of a loop; yet if these items are properly taught and practised solo they will greatly assist the novice in finding his way in a new medium and will plant within him the first seeds of confidence, born of the conquest of fear. Similarly with cross-countries—of no practical use, says Captain Brice; but at this stage a few visits to other airfields, even if the weather is perfect, can be of outstanding importance in convincing the pupil that he can find his way in the air and land at a strange field *himself*.

Passing to the next step in Captain Brice's programme, it is suggested that the trainee should act as supernumerary crew member as and when possible and thus familiarize himself with the conditions and procedures involved in airline flying. Such experience is, of course, essential; but is there not a somewhat frightening gap in the pupil's training? There is a vague reference to further specialized flying to Commercial Licence standard, but after that the potential airline captain is to proceed with his airborne clerical work, "making his way towards the captain's chair." During the later phases of this period he will presumably occupy the right-hand seat and begin to handle the aeroplane for himself. Bearing in mind his previous actual flying experience, the reactions of his captain (and his passengers) should, incidentally, be interesting to watch. Assuming, however, that all goes well, he eventually graduates as a fully-fledged airline captain, experienced in procedure, and well versed in the geography of the places which he visits and the history of the airline—but, very possibly, knowing precious little of his own limitations and reactions in an emergency.

Consider an extreme case. The pupil gets his initial spell of flying in reasonable weather and manages quite well. For reasons of economy his additional "specialized" flying for a Commercial Licence is carried out on a light aircraft, and again the weather is not unkind, with the result that he fulfils the flying syllabus for his licence without undue concern. The remainder of his flying experience on an airline has been commendably free from incident and, of course, his personal safety has not been his own responsibility but rather that of his captain, who, despite the dreaded stigma of having been one of the redundancies of the armed Services, is a particularly capable airline pilot. During all this time it is quite possible that the young man will never have been faced with a situation of the kind which he would have been reluctant to tackle through plain funk—and which, having been dealt with successfully, would have enabled him to benefit from the knowledge of his reactions.

Consider his counterpart in the Service, with all his bad habits and lack of licences. Quite apart from basic discipline and a first-class *ab initio* flying training, there can be few Service pilots even in peace-time who, at a comparatively early age, have not learned that they could accomplish far more than their initial apprehension had led them to believe—whether it is a matter of high-speed flight, close formation in prolonged turbulence, or straining their aircraft to its uttermost limits (both in the book and out of it), in the course of a competitive exercise. Bad habits? Certainly they are, from a civil aspect; but at least these young men can fly and, what is equally important, have become familiar with their own reactions in extreme circumstances. In short, they are masters of themselves as well as their aircraft. It is this very quality—so long taken for granted in the ex-Service pilot and yet, perhaps, the most valuable qualification which has assisted so many of them in their subsequent graduation to airline captaincy—which will be decidedly lacking in the candidate who has undergone the suggested course of cut-rate pilot-training.

But there is little to be gained from relying upon the Service as a future source of civil pilots. It is, of course, true that very soon (if not already) the R.A.F. will be determined to retain their fully trained multi-engine pilots and the fighter boys will presumably dwindle in number as the guided missiles fly thicker and faster.

What then, is the answer? Before considering a possible solution let us have three facts clearly in mind. First, if "pilots" are to be produced on a cheap-as-possible basis there will be an increasing number of accidents; if there are more accidents, then the airline and the manufacturers will suffer financially. We cannot afford not to have properly trained and fully qualified pilots. Second, ours will not be the only country faced with such a problem. There will be others, with even less financial resources than our own, who certainly cannot afford to train their own pilots thoroughly but who nevertheless appreciate the importance of such training. Third, it must be realized that not only airline pilots will be required: if the Service holds on grimly to its small band of highly trained pilots there will be a demand from the industry for test pilots, and even a subdued whisper from the flying clubs for instructors—to name but two examples.

A Possible Solution

So much for the demand: to meet it we must have a flying training college, by its very nature and scope a nationalized concern—unfortunate as this may be—to take boys of eighteen with a reasonably high educational standard. It would train them over a period of three to four years so that they would emerge as qualified pilots, well versed in the art of flying, possessing a sound theoretical background, the necessary civil licences, and a certain amount of specialized training in the particular branch of flying which they have chosen.

To achieve this aim a syllabus could be based broadly upon the following lines. During the first year ground training would include basic theory of flight, airmanship and air-traffic control, meteorology, pilot navigation, engines (piston), mathematics, Link and signals. Flying training would consist of 75 to 100 hours, at least 25 of these being solo, on a light piston-engine

PRODUCING THOSE AIRLINE PILOTS . . .

trainer equipped with radio so that a comprehensive *ab initio* programme may be fulfilled, including instrument flying, G.C.A.s, and night flying, not forgetting spinning and aerobatics, cross-countries and formation flying.

Ground training for the second year, apart from covering more advanced aspects of the subjects already mentioned, would include aerodynamics, particularly concerning high-speed flight, extensive Link training in the use of radio aids, airways, etc., flight planning and aviation law. Air training would consist of at least 100 hours, to comprise 40 hours on a single-engine aerobatic, jet-powered, trainer, and 60 hours on a relatively simple medium twin (piston engine). The flying programme should include, first, high speed, high-altitude flight, formation and cross-countries in all weather conditions, aerobatics and advanced instrument flying. Having successfully completed these exercises on the single-engined trainer the pupil would proceed to twin flying and be trained in all-weather asymmetric flight, "long-distance" navigation, both as pilot and navigator, use of radio aids and airways and practical flight planning.

At the end of the second year the pupil would sit for his Commercial Licence examination and undergo flying tests. He would then be ready to proceed with his final year or eighteen months' training, the length of time depending upon the type of flying he had chosen and for which he has proved himself suitable. Assuming he were to become an airline pilot, the final period would probably extend to eighteen months and would include an extensive ground training programme of Link, advanced navigation, meteorology, etc., flight operation, languages and specialized geography (his school training should have provided a sound basic knowledge of the two latter subjects). Flying training would cover further twin-engine experience, with the accent on applied instrument flying in all weather conditions and, if possible, five hours or so on a four-engine aircraft, sufficient to enable him to manage at least one flight as captain. At the completion of his training he should be ready to qualify for his Flight Navigator's Licence and take his place as a relatively useful member of an airliner crew.

Obviously, the immediate objection to such a project is that the Country cannot possibly afford it: the plain answer is that it is up to the Guild, and to such M.P.s as are qualified to do so, to convince the Government that we simply cannot afford to do without it. Such a college should be able to rely upon financial support from, in the first place, the Government and the State-controlled airlines themselves—after all, it is principally on behalf of the latter that such an establishment is required; and, once having been formed, its staff could do at least part of the work of the instrument training flights and testing units at present operated by the airlines and the Ministry of Transport and Civil Aviation. The second source of support must be the manufacturing companies, since there can be no doubt that the supply of future pilots to fly their products, and to test them, is a vital consideration, despite the unpleasant prospect of financial outlay. Third, the overseas governments would pay the full cost of training their pupils; and, fourth, the trainees themselves (or, rather, their parents) would assist to a greater or lesser degree as circumstances permit.

There is the idea; let those who have better alternatives tear it to pieces. This question has obviously no simple solution: it needs careful thought and argument. If the present article has gone a step further in provoking such thought by the people best qualified to advise on such matters—the pilots themselves—so much the better.

Yorkshire Celebrates the Wright Jubilee

BIGGEST of the powered-flight jubilee celebrations held in the provinces was the dinner given in the Guildhall, Hull, by the Brough branch of the Royal Aeronautical Society. The numerous guests included civic officials, the president and the secretary of the R.Ae.S., senior officers of the Services and executives of various engineering and other firms.

Mr. Eric Turner (managing director, Blackburn and General Aircraft), proposing a toast to "The Pioneers of Aviation," reminded his audience that the Wright biplane's first flight was over a distance less than three-quarters of the wing span of the Beverley transport. He went on to say that Mr. Robert Blackburn was the oldest pioneer, in length of service, still active in the aviation industry—and that his 1912 monoplane was the oldest aircraft still airworthy. A Blackburn aircraft had been the first to make the double crossing of the Bristol Channel, and the first to demonstrate aerial wireless telegraphy. In 1919 Mr. Blackburn had formed a company to fly passengers from Hull to the Continent.

(Below) Mr. G. E. Petty, chairman of the Brough branch of the R.Ae.S. speaking at the dinner. In the foreground, right to left, are Councillor B. Svenson, Sheriff of Kingston-upon-Hull: Mr. Eric Turner, Blackburn managing director: and Sir William Farren, president of the R.Ae.S., technical director of A.V. Roe and formerly of Blackburns.

At the jubilee exhibition: standing under a wing-tip of the 1912 monoplane, and in front of the B.2 trainer, Mr. Robert Blackburn talks of early days to Major F. A. Bumpus, a director: behind the chairman is another Blackburn director, Mr. N. E. Rowe.

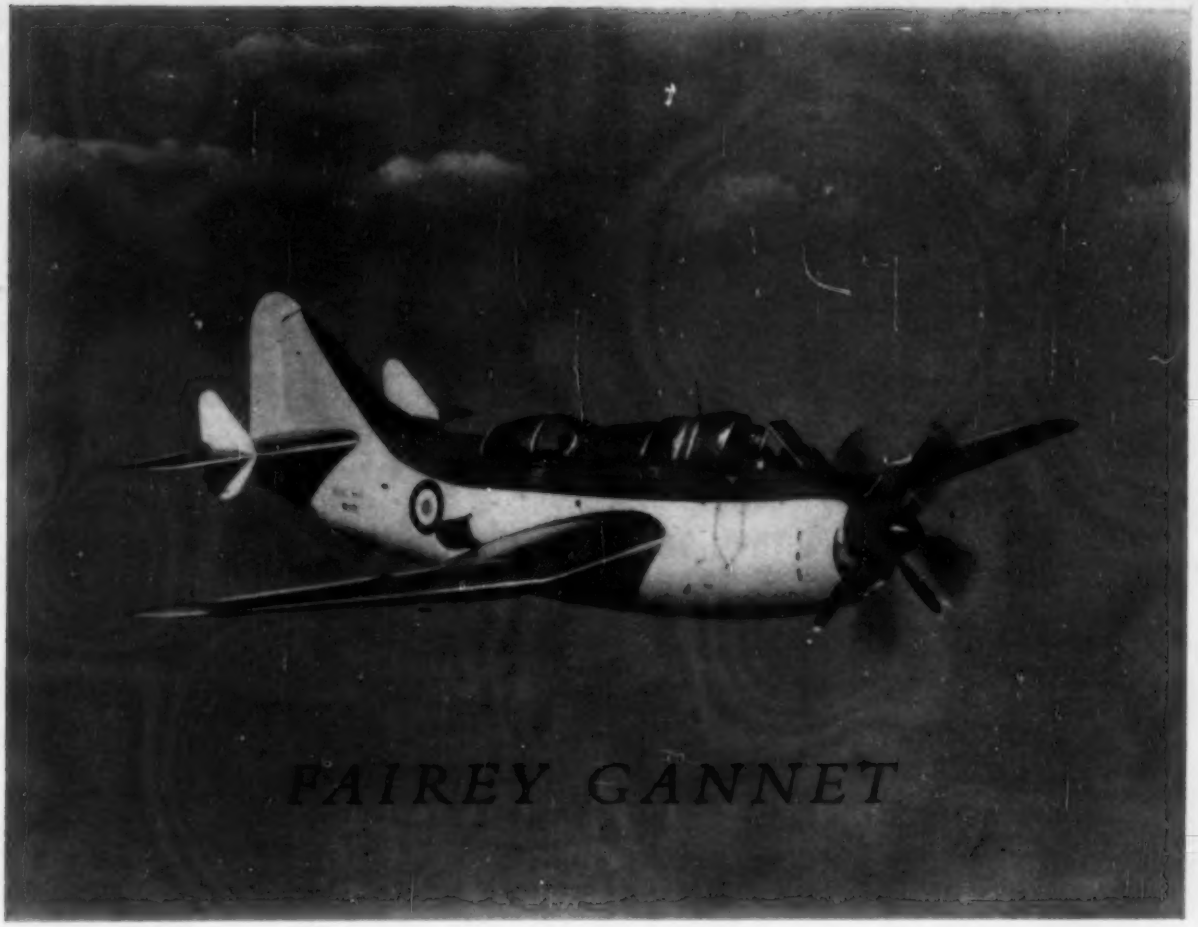
In his response to the toast, Mr. Blackburn (chairman of the group, and president of Brough R.Ae.S. branch) described the Wright brothers' flight as "an epoch-making event in the history of aviation—it was like breaking down a law of nature." He also made the point that many years before this a Yorkshireman—Scarborough-born Sir George Cayley—had established mathematically the basic principle of mechanical flight.

The toast of "The Guests" was proposed by Mr. G. E. Petty, chairman of the branch, and the reply was by Sir William Farren, president of the R.Ae.S.

During the course of the evening the Lord Mayor of Hull presented to Mr. Blackburn a plaque bearing the city's coat of arms, and later the company watched the Shell film *Powered Flight—the Story of the Century.*

Models of historic Blackburn aircraft which decorated the tables included the 1909 monoplane (with its car-like seat on the tricycle undercarriage, which also housed the four-cylinder engine), a Lincock, Dart, Skua and B.2 trainer.

Before the dinner, many of the guests called in at a jubilee exhibition organized in the showrooms of the Triangle Motor Co. in Hull; here they were able to see the actual 1912 Blackburn monoplane and B.2 trainer, a section of the Universal's freight compartment, and Bombardier and Turboméca Marbore engines.



Powered by an Armstrong Siddeley "Double Mamba"

THE Royal Navy, which has to maintain sea communications, regards counter-measures to the submarine threat as of first importance. Much of the new anti-submarine equipment is specialised, and demands unique capabilities and characteristics from the aircraft employed. To cover this feature of defence the Fairey Gannet is in super-priority production, and has also been ordered for the Royal Australian Navy.

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The background design shows a few of the 181 types that have been fitted with de Havilland propellers in the past 18 years

AIRCRAFT INTELLIGENCE

NEW FOR THE NAVY: Large transonic fighters for the U.S. Navy include the Douglas XF4D-1 Skyray (top) and the Chance Vought F7U-3 Cutlass. Both use slatted, swept wings of very low aspect ratio, and neither has a horizontal tail surface. Carrier trials have been in progress with both types since the autumn of 1953, and both should equip ship-based units this year. A Douglas XF4D-1 Skyray is being prepared for an attempt on the absolute height record.

Great Britain

English Electric Transport. American sources continue to report that the English Electric Company are developing a novel DC-3 replacement, powered by a Double Mamba turboprop. Such a design would certainly be lighter and have less drag than a machine of similar capacity with separate, wing-mounted engines. For our part, we feel such a concept has much to offer, and would qualify for certification as a twin-engined machine.

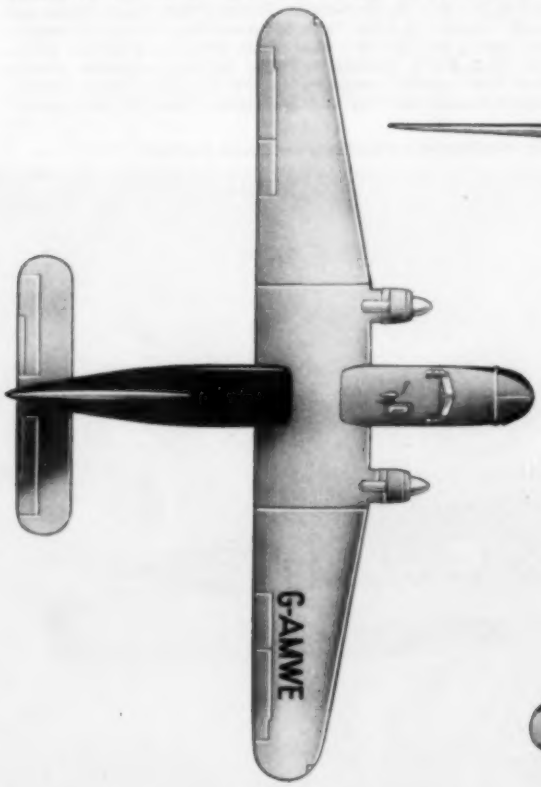
Hawker Hunter. At the time of writing it is still not clear what form of speed brake will be used in the production Hunter. The record-breaking WB 188 has been fitted with brake panels at the extreme tail, one on either side of the jet-pipe, and actuated by jacks faired in to the rear fuselage. Such an arrangement may be adopted, in a cleaned-up form, as a standard fitting. At subsonic speeds the main wing flaps can also be used as brakes, to a limited extent.

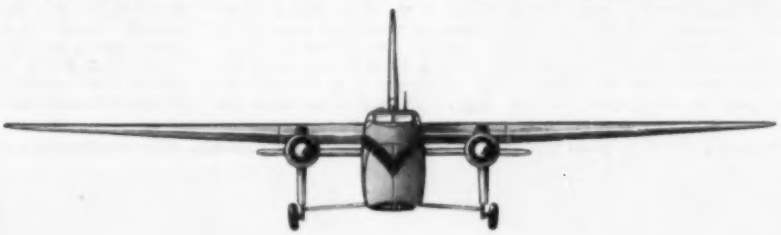
United States

Vought F7U-3 Cutlass. From the Chance Vought plant at Dallas are coming fair numbers of Cutlasses, one of which is shown on this page. Difficulty with the Westinghouse J46 continues, but this engine is now confirmed as standard; the F7U-1 had two J34s, and early F7U-3s a pair of Allison J35s. The Cutlass carries two 20mm guns above each engine, firing through the upper lip of the intakes. A new, and very large, canopy affords good view, except to the rear. The nose houses a radar fire-control system; other features are the large elevons and slats on the wings; the fins and rudders are carried on the wing trailing edge.

Italy

Fiat G.82. Although not confirmed by Fiat, it is reported that a new jet trainer, with the above designation, is the subject of a small production order by the Italian Air Force. The G.82 is a development of the G.80 Goblin-powered machine, with a fatter fuselage housing a Rolls-Royce Nene. It is not likely that the G.82 will have a limiting Mach number greater than 0.9.





BRISTOL 170 Mk. 32 SUPERFREIGHTER
(Two Bristol Hercules 734)

Span	108ft
Length	73ft 6in

Instructors at Zweibrücken: (Left to right) F/O. M. A. Grant, F/O. R. H. Annis, F/L. K. C. Lett (Commanding Officer), F/O. J. G. Gagne and F/O. W. G. Nixon.

"FLIGHT" photographs

FOR

The Work of No. 1 Air Division Instrument Rating Flight, R.C.A.F.

DURING our recent visits to R.C.A.F. stations in Europe, on the occasion of the tour by Mr. Brooke Claxton, the Canadian Defence Minister (*Flight*, December 25th), we were able to see No. 1 Air Division Instrument Rating Flight in operation at Zweibrücken. It was, in fact, only through the exceptional blind-flying ability of F/O. Nixon, one of the instructors, that we were able to attend the presentation of the Queen's Standard to No. 3 Squadron, R.A.F. Incidentally, this flying visit was a perfect example of NATO in action: the journey was made in an R.C.A.F. Canadair-built Lockheed T.33 from Zweibrücken in the French Zone to Geilenkirchen in the British Zone, where a Belgian officer was operating the G.C.A. Conditions were just about as bad as possible, yet the whole flight—even to the instructions as to which way to taxi in the Geilenkirchen gloom—went off without the slightest hitch.

Commanded from the outset by F/L. K. C. Lett, the Instrument Rating Flight was formed at Zweibrücken and is the only unit to have Nene-engined T.33s. These aircraft have been found very suitable and consistently serviceable. We were informed that the extra 800 lb thrust of the Rolls-Royce Nene as compared with the Allison J33 has put the Mach number up to 0.82, with comfortable cruising at 0.76. The Allison J33-A-35 specified for the T-33 is officially rated at 4,600 lb dry, while the Nene gives 5,100 lb. Thus, if the difference is in fact 800 lb, it may be that some J33s are slightly derated when used for training purposes. The Mach number of 0.82 is presumably the maximum attainable in level flight.

The pupil sits in the rear seat, and while he is under instrument instruction a linen canopy shuts out all external vision. With wing-tip tanks the T.33 carries 680 gallons, sufficient fuel for 2½ hours' flying, or a range of 1,400 miles. The Flight, however, usually make 90-minute sorties, one hour being devoted to instrument flying and the remaining 30 minutes to G.C.A. practice. All flying is dual and the instructors each put in about 50 hours a month.

The "pupils" under instruction come from all the R.C.A.F. stations in Europe, including North Luffenham in Britain, and are selected as section leaders, not as potential instructors. It is felt that they may easily find themselves in such conditions that, by doing automatically in an emergency what is continually practised, they may save not only their own lives and aircraft but also those of the sections they may be leading.

If the weather is appropriate the course lasts 14 days but unsuitable conditions may extend it by as much as 50 per cent. At Zweibrücken, which is 1,100ft above sea level, the limiting factors for use by the squadrons stationed there are 600ft between the lowest cloud layer and the runway, and horizontal visibility of one mile. For the Instrument Rating Flight these figures are halved. Green and white cards are issued but there is no master green; taking its place is a blue rating issued to transport pilots.

The R.C.A.F.'s instrument-flying training schedule closely follows the pattern employed in the R.A.F.; blind take-offs, straightforward, climbing and descending turns on "full panel"

Portrait of a T.33, or Silver Star, showing the uninterrupted view from both seats. The blind-flying hood is in the stowed position.

NSTRUMENT TICKETS

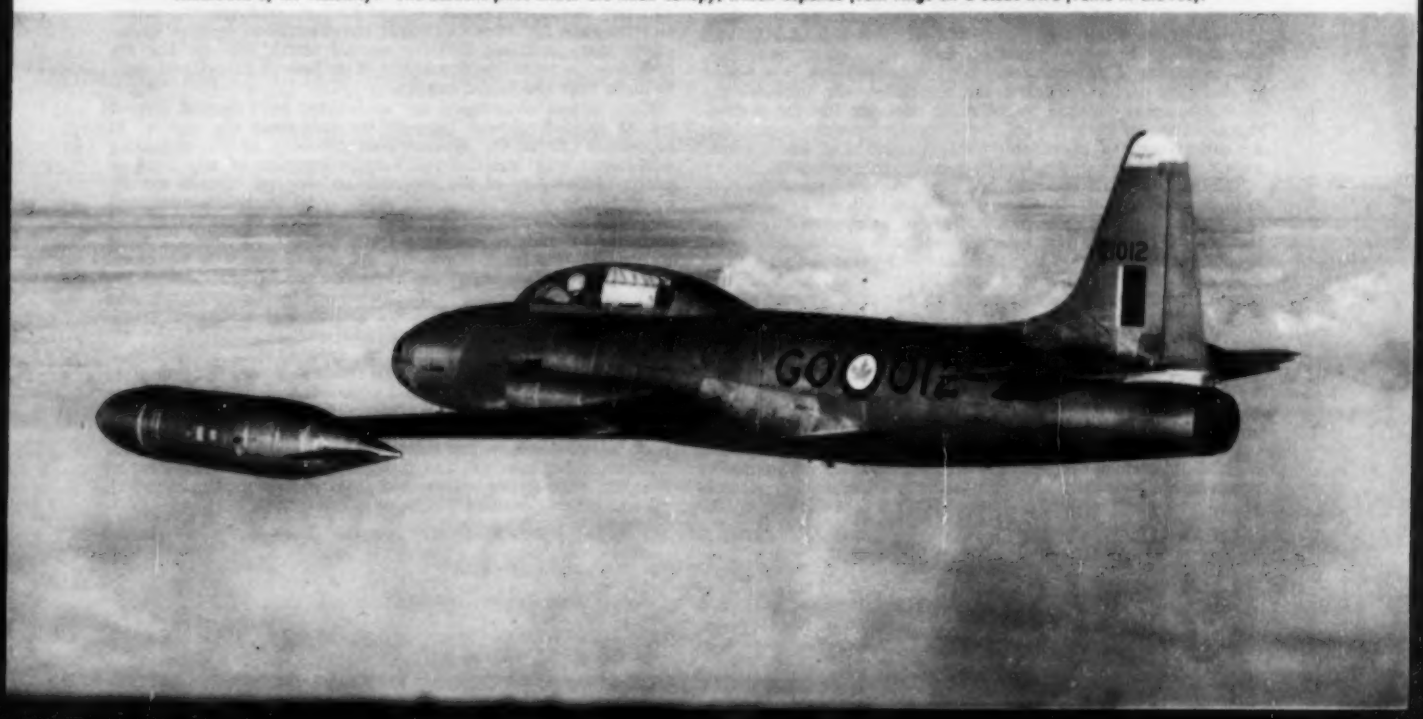
An instructor, F/O. Grant, sees that his "pupil," F/O. G. B. Shorey, is properly installed in the back seat of a Canadair-built Lockheed T.33.

(Below) Breakaway: After flying alongside for the photographs at the bottom of these pages a T.33 turns sharply away to return to Zweibrücken.

and "limited panel"; high- and low-speed exercises at various altitudes and the "twizzle"—a timed turn during which a predetermined altitude must be gained.

Candidates are put through 12 exercise flights graded in severity up to the final standard for the rating (green or white card) desired. The main differences between the Canadian syllabus and that of the R.A.F. stems from the greater number of navigational facilities carried in the T.33. Exercises are planned using radio compass, radio range and ground beacons; both cross-countries between England and Germany and a variety of position-fixing procedures are flown blind. Particular attention is paid to G.C.A. and let-downs on what might be termed "primary navigation panel," with no more than D.F. and G.C.A. No fewer than four distinct types of let-down are practised—QGH, single beacon, radio range, and cruising.

Conditions of nil visibility: The student pilot under the linen canopy, which depends from rings on a stout wire frame in the roof.

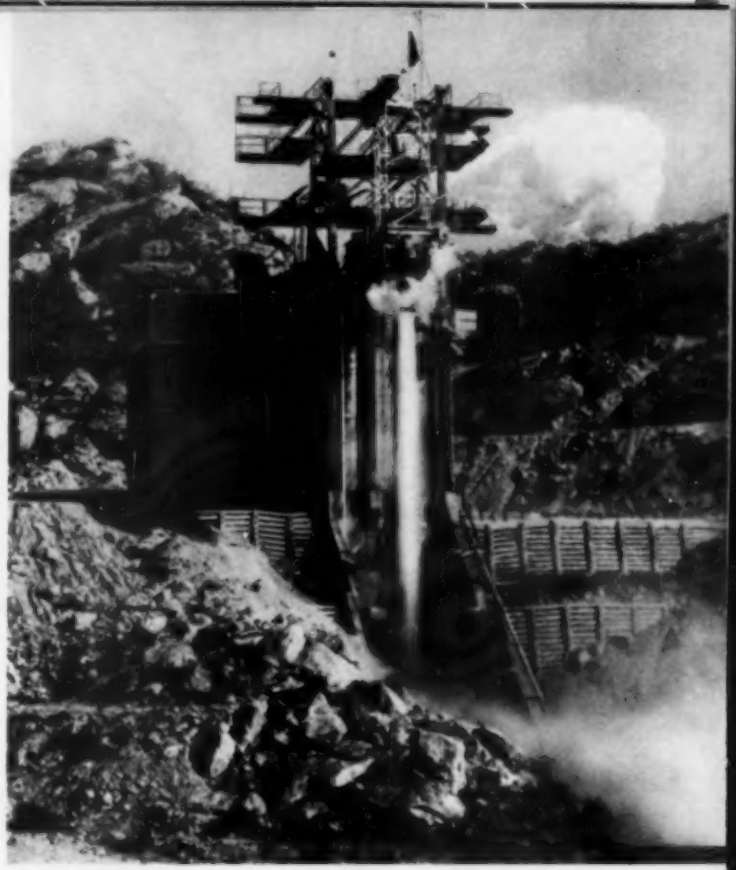


ROCKETS on the MOJAVE

The U.S.A.F.'s Static-test Station in Southern California

FAR out in the windswept vastness of the Mojave Desert in Southern California, the scattered buildings of ERETS (Experimental Rocket Engine Test Station) stand in testimony to the efforts of the United States Air Force to solve the many and complex problems of rocket-powered flight. Built on a series of sun-baked granite ridges, the vast test-stands, the gleaming, odd-shaped propellant storage-tanks, and squat, one-storied buildings provide a bizarre contrast to the miles of uninterrupted desert surrounding the station.

Operated by the Rocket Branch of the U.S.A.F. Engineering Laboratory, the station is under the control of the Air Force Flight Test Centre, Edwards Air Force Base, Calif. While the primary mission of the Air Force Flight Test Centre is the flight-testing of aircraft and components, rocket-motor tests at ERETS often parallel flight tests of prototype missiles and aircraft conducted at the Flight Test Centre itself.



Suggestive of some science-fiction moonscape: a rocket motor running on one of the static test structures. Near the tip of the flame, on each side, can be seen the pipes from which water is sprayed on the concrete.

In the early days of rocket development elaborate test-stations were unnecessary. The relatively simple and inexpensive rocket could be designed, built, and tested in free flight with little equipment and expense. But once launched, a missile is usually a total loss. If a valve or control fails nothing can be done but evaluate the wreckage and try again. After World War II it was revealed that the Germans fired some five per cent more V.2 rockets in tests than they launched at the British Isles during the entire six months for which the weapon was in operation.

As rockets increased in size, thrust, complexity and cost, it became impracticable and uneconomical to conduct the whole testing programme in free flight; the need for static test rigs was now imperative.

So far as America was concerned, such a facility became a reality with the inauguration, early in 1951, of the Experimental Rocket Engine Test Station, under the supervision of Harry H. Clayton, Chief of the Engineering Laboratory, and Richard F. Gompertz, Chief of the Rocket Branch at the Air Force Flight Test Centre. One hundred and forty miles north of Los Angeles and near the centre of the Mojave Desert, the location at Edwards was chosen because of the remoteness, usable area, terrain features, availability of water and power supplies, isolation consistent with necessary safety and security precautions, and accessibility. Only 31 road miles from the rocket station, Edwards A.F.B. can accommodate the largest transport and cargo aircraft in service. The advantage of proximity to a large industrial area is provided by the City of Los Angeles; and the desert site provides the isolated location required by the noise nuisance and the psychological effects of rocket tests, the danger of violent explosions, the toxic nature of propellants such as nitric acid, and a stable terrain able to resist the tremendous forces generated.

The station itself is something new in management as well as in physical layout. It is one of the first facilities to be owned and staffed by the Government for use by contracting firms. Here the contractors test missile propulsion systems and components, utilizing U.S.A.F. equipment and personnel as well as their own. It is much cheaper, and more efficient, to build one completely equipped plant for use of all contracting agencies than to build (directly or indirectly at Government expense) separate, though less complete, facilities for each. In addition, the test station is an excellent place at which to train personnel in the specialized skills required.

The station is built along a series of granite ridges overlooking the desert floor. By far the most prominent structures are the great concrete and steel static-thrust test stands. Perched apparently precariously on the edge of a sheer cliff, each stand is built to withstand the strain of many thousands of pounds of thrust acting vertically. Motors under test are carried securely in massive steel mounting cradles. To prevent damage to the concrete by the extremely hot blast of large rockets, a deluge system is installed which floods the base of the stand with a cooling stream of water. A similar system, for use in emergency, is built into the test stand itself; operated automatically as well as manually, this high-pressure system drenches the entire test stand with jets and sprays of water in the event of fire.

Since the object of test at the station is to approximate as nearly as possible conditions encountered in free flight, as many such factors as are practicable in static tests are simulated. The mounting cradles may be tilted to various angles, and equipment to simulate other flight conditions, such as reduced pressure and extremely high or low temperatures, is at present under development.

Provision is made for mounting more than one motor on each stand. Although the motors are not operated simultaneously, this arrangement enables setting-up time between tests to be cut. Steel shields protect the engines from the effects of nearby runs. The test stands incorporate storage for fuels and oxidants necessary for extended runs (ordinarily the propulsion systems themselves carry sufficient fuel for normal tests). On the site are bulk storage tanks for thousands of gallons of propellants such as nitric acid and liquid oxygen.

Control and observation are maintained by a central control station located midway between the two main test stands. It represents one of the greatest concentrations of data-recording equipment ever installed for the development of any kind of power-plant. Any of the recorder and control circuits can be connected to either test stand. Apart from instrumentation and oscillographs, both optical and direct viewing of the stands and surrounding area is available from the control station, while elaborate safety features prevent the risk of injury to personnel by explosions or toxic gases. Any special instrumentation required for a particular test is furnished by the contractor and may be connected to either test stand through additional transmission circuits.

ERETS is nearly self-sustaining, incorporating office accommodation, maintenance and general machine-shops, transportation facilities, photographic services, a 200-dial automatic telephone exchange, and housing and eating facilities for transient personnel.

In addition to direct tests of rocket motors, a great deal of materials-research is conducted. The use of highly corrosive chemicals, for instance, has brought about the development of titanium seatings for valves, and from such work the chemical, oil and other industries will benefit indirectly.

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ACCOMMODATION 10 to 12 passengers, their luggage and a crew of two with full radio aids.

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Initial Rate of Climb. 1380 ft/min. (4·21 ms/sec.)
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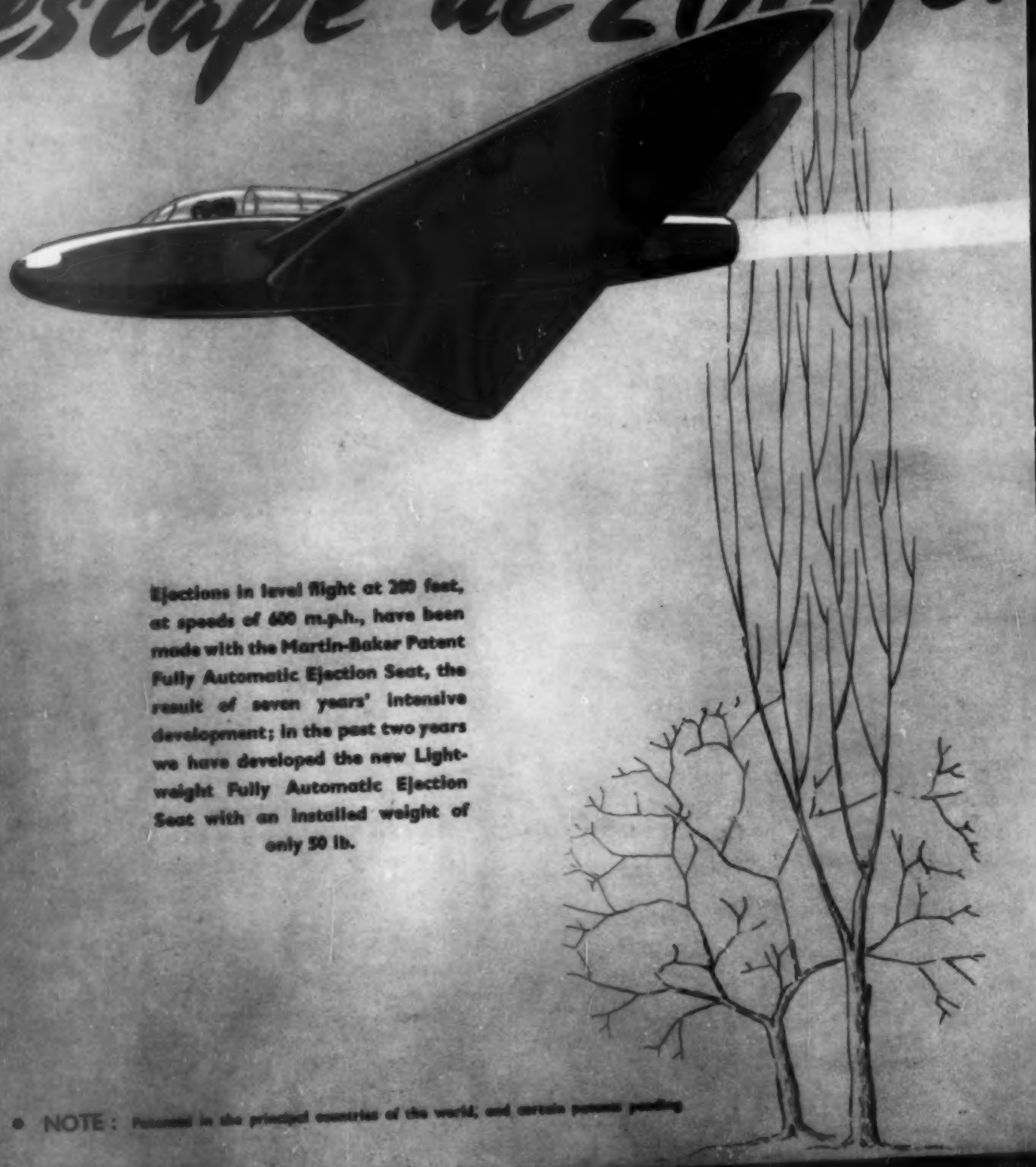

Ejections in level flight at 200 feet, at speeds of 600 m.p.h., have been made with the Martin-Baker Patent Fully Automatic Ejection Seat, the result of seven years' intensive development; in the past two years we have developed the new Light-weight Fully Automatic Ejection Seat with an installed weight of only 50 lb.

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HUNTING-CLAN

One of Hunting-Clan's eight Vikings returns to base at Bovingdon, carrying Service passengers from Malta.

Air-Sea Alliance: The Background to Some Efficient Independent Airline Operations

FINANCIAL and operational partnerships between shipping lines and air transport operators, although widely recognized as a good thing, are not yet practised to any significant extent. Hunting-Clan Air Transport, Ltd., is doubly exceptional, for, as its name implies, this British independent company is backed not by one but by two old-established shipping concerns. The fortunes of the renowned Hunting Group of companies were founded on shipping in the nineteenth century, and, although some of its numerous members are today engaged in aviation and the oil industry, a fleet of 16 tankers of 240,000 tons dead weight remains one of the Group's major assets.

The sub-group concerned with aviation includes Percival Aircraft, Ltd., Hunting Aerosurveys, Ltd., Aerofilms, Ltd., and Field Aircraft Services, Ltd. Hunting Air Travel, Ltd., was added shortly after the war, and this company began operations on January 1st, 1946. Its subsequent growth was gradual and unspectacular, but this is a reflection on the post-war conditions affecting independent airlines in general rather than on any lack of initiative on the part of the Hunting group. After eight years, Hunting Air Transport (the name was changed in 1951) had emerged as one of the healthiest and most securely founded British independents.

Its prospects were further improved by the decision of the Clan Line group of companies to invest in both Hunting Air Transport and Field Aircraft Services. The value of this support can be gauged from the fact that the Clan group operates 57 vessels totalling 600,000 tons, dealing mainly with cargo.

It was announced in October that the Hunting and Clan groups would each contribute £500,000 to the initial capital of a company to be known as Hunting-Clan Air Holdings, Ltd. This company, in turn, would take over the entire share capital of both H.A.T. and F.A.S., and the former would in future operate under the title of Hunting-Clan Air Transport, Ltd.

The potentialities of this arrangement appear to be considerable. In the first place, the Hunting-Clan alliance makes available to the air company an organization experienced in securing and handling freight on a world-wide basis; it also provides the capital required for buying the new aircraft on which the growth of both freight and passenger traffic depends. It does not follow that there will be any sudden expansion of the Hunting-Clan air network, or any sensational announcement of orders for new aircraft; but, from the long-term viewpoint, the ability to expand will be there as opportunities appear.

Four Dakotas are used by the company on the Northern network and on charter work; one is shown undergoing maintenance at Bovingdon. "Flight" photograph

In order to survey the present activities of the Hunting-Clan company, we visited its main base at Bovingdon. The present operational fleet consists of eight Vikings and four Dakotas, trimly finished in a new red, white and pale blue colour scheme. The size of both fleet and staff are closely tailored to the scale of operations undertaken—contract, scheduled and charter services—and costs are kept to the minimum. The aircraft are flown by 26 crews at an average annual utilization rate of 2,200 hr for Vikings, slightly less for Dakotas. One Viking recently flew 300 hr in a month. Including traffic and catering personnel, and drivers, the Bovingdon staff—headed by base manager David Ince—consists of no more than 30 people. In off-duty hours, Mr. Ince is a sailplane enthusiast; he was reserve pilot of the British team in the 1952 World Championships.

The team of executives at the company's London H.Q. is correspondingly compact. Despite his diverse interests as chairman of the entire Hunting group, Mr. P. Ll. Hunting (a former R.F.C. captain) maintains close contact with the airline staff. The managing director, Mr. Maurice Curtis, is a leading figure in the world of air transport, which he joined in 1930 as an Imperial Airways trainee. Responsible to him for the development of the company's two main classes of traffic are Mr. H. G. Matheson, scheduled services manager and Mr. R. Wingrave, charter manager. The technical manager is Capt. L. B. Greensted, M.B.E., former chief test pilot of Rotol, Ltd., who was recently awarded a G.A.P.A.N. Master Pilot Certificate.

Next year Hunting-Clan will become the first British independent airline to operate Viscounts. Three Series 730s are on order. The interior layout of these aircraft has not been finally determined, but they will probably be high-density versions seating over 50 passengers. Planning for the Viscounts' introduction is one of the main preoccupations of Capt. Greensted, assisted by development engineer H. B. Cundall. Based at Bovingdon, Mr. Cundall joined the company last November. After war-time engineering service at Boscombe Down he became a member of the A.R.B. design staff in 1946 and was promoted to senior surveyor three years later.

As yet, however, 31/34-seat Vikings remain the backbone of the company's small but hard-worked fleet. Among Hunting-Clan's aircraft, incidentally, there are representatives of all three versions of the Viking—two short-nosed, fabric-winged Mk 1As; five short-nosed, metal-winged Mk 1s; and one long-nosed, metal-winged Mk 1B. Six are ex-B.E.A. Vikings and one—the 1B—has flown in the colours of both Aer Lingus and Misrair. In August 1951 this latter aircraft belly-landed in the Lebanon and, as recounted in *Flight* of January 9th, was the subject of a remarkable salvage operation by Field Aircraft Services, who restored it to mint condition before its return to work with Hunting Air Transport. Field's are responsible for overhauling and servicing all the Hunting-Clan aircraft; the work is undertaken at Bovingdon. On average, the Vikings have logged about 6,000 hr each. I.L.S. is being added to the comprehensive equipment carried by Hunting-Clan Vikings, which includes S.B.A., radio compass, V.H.F./D.F., R/T. and W/T. Two pilots and a radio officer form the standard flight crew, and there is a stewardess on all passenger flights; flight engineers are also carried on the long-range "Safari" services.

Although Bovingdon is an adequate base for the company's present operations, an eventual move to London Airport—perhaps within the next year or two—is under discussion. The Minister of Transport and Civil Aviation, Mr. Lennox-Boyd, revealed in the House of Commons last October that " . . . we have told Airwork and Huntings . . . that if they accept our terms we shall offer them accommodation at London Airport . . ."

Although the fleet is committed mainly to scheduled services and regular trooping flights, the company is active in the charter market. Ships' crews are frequently moved on a charter basis, and parties of students also helped to swell the amount of charter

"Flight" photographs

Newly arrived from Malta, troops are seen disembarking from a Viking of Hunting-Clan at Bovingdon. On the right are Capt. R. W. L. Mulliner: the company's chief pilot, and Mr. David Ince, base manager. The new title Hunting-Clan has not yet been painted on all the company's aircraft.

HUNTING-CLAN . . .

flying (about 3,000 hr) by Hunting-Clan aircraft in 1952.

Between August 1951 and October 1953, when the Air Ministry contract was renewed for two years, Vikings of H.A.T. made 1,016 flights between Bovingdon and Malta and 232 on the Bovingdon-Gibraltar route, carrying a total of 75,333 Service personnel and members of their families. The contract calls for a minimum movement of 30,000 passengers annually on these two routes, which is equal to about 30 per cent of the total number of trooping-contract passengers now carried each year by the British independent operators.

Hunting-Clan now hold Government approval to operate scheduled services on 11 routes. In each case the approval extends until 1960, thus providing—as intended under the Government policy initiated last year—a reasonably secure basis for forward planning. These routes form two networks: the Colonial Coach services from London to Nairobi and to Salisbury; and the Northern network centred on Newcastle.

Colonial Coach services were jointly inaugurated by Airwork and Hunting in June 1952 on the "Safari" route to Nairobi *via* Malta, Wadi Halfa, Khartoum, Juba and Entebbe. Not only did this service prove remarkably successful from the commercial viewpoint (after nine months it was announced that an average load-factor of no less than 93 per cent had been maintained), but it succeeded without diverting traffic from the more expensive first- and tourist-class services of B.O.A.C. There are now two services weekly on this route, operated alternatively by Hunting-Clan and by Airwork. The second Colonial Coach service, inaugurated last June, consists of fortnightly flights (one round trip monthly by each company) between London and Salisbury.

The Northern network, operated with Dakotas, was to have come into full operation in 1953 but I.A.T.A. objections to the proposed fares for the Scandinavian routes held up their inauguration. Hunting later became the first British independent to join I.A.T.A. and at the Honolulu traffic conference a resolution was passed permitting fares 10 per cent below tourist level on the Newcastle-Oslo-Stockholm and Newcastle-Hamburg-Copenhagen routes. These services will start in the spring on a twice-weekly frequency, and at the same time the Bovingdon-Newcastle daily service will return to a twice-daily frequency. Twice-weekly services will also be flown between Newcastle and Paris; the Newcastle-Amsterdam service, also twice-weekly, is already in operation. In addition, there will be feeder services from Glasgow and Manchester to Newcastle.

Provisional traffic figures for the year which has just ended show that the company's 12 aircraft flew some 2,908,000 miles and carried over 72,000 passengers—increases of, respectively, 10 per cent and 22 per cent on the previous year's totals. The introduction of fresh services in 1954 should quicken this rate of growth; there is unlikely to be any difficulty in finding employment for Hunting-Clan's Viscounts when they are added to the fleet next year.

R.B.

DISCUSSING PRODUCTION

The Remaining Papers from the Southampton Conference Summarized

LAST week we published abbreviated versions of two of the papers which were read before the Conference of the Institution of Production Engineers held in Southampton last month. On these two pages are similar accounts of the remaining three papers, together with notes on the discussions which they provoked.

THE TREND OF DESIGN

By D. Keith-Lucas, B.A., M.I.Mech.E., F.R.Ae.S., chief designer, Short Brothers and Harland, Ltd.

THE key to this paper was provided by the lecturer's unprinted preface that there was nothing quite so secret as the trend of design; he therefore proposed to confine himself to a discussion of what was "going to happen during the last five years."

He showed photographs supporting his contention that, while aircraft built to a common low-speed specification were usually almost identical, those conforming to high-speed specifications frequently appeared quite different, showing that, in the latter sphere, the designer was breaking new ground and feeling his way. Further complicating factors facing the designer of transonic aircraft were the necessity for preserving a smooth exterior finish and the considerable increase in complexity and density of the internal equipment.

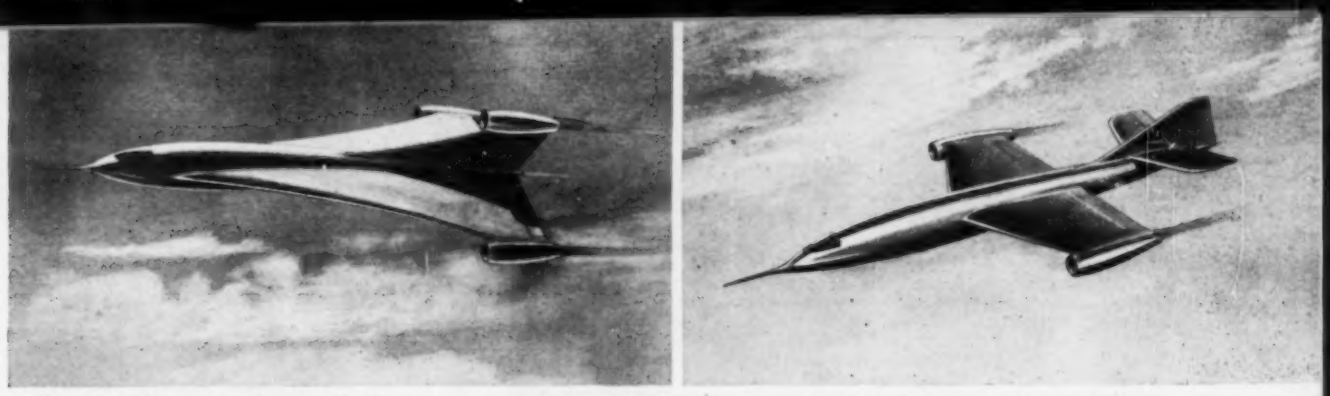
Two hypothetical aircraft (which the lecturer then illustrated —see opposite page) were possible alternatives for a Mach number of the order of two. In both cases, said Mr. Keith-Lucas, the thickness/chord ratio was very low, and, of the two, he confessed to "a certain partiality" for the delta, mainly on the ground that its wing could be used to stow fuel or equipment. The delta's principal drawback was its high angle of attack and consequent high induced drag.

With many modern aircraft the interior was already overflowing and such items as power plants and fuel tanks were often mounted externally. Tomorrow, said the lecturer, "we can no longer be content with slinging these outside; we will have to sling them out. I would like to start with the undercarriage . . ."

The major part of the paper was concerned with a review of modern developments in structures, in the course of which Mr. Keith-Lucas discussed metal bonding and sandwich construction —"my guess is that we will see it used extensively in the future and not only for secondary structures, nor only on light aircraft"; integral machining (one of his company's essays in this field was described in our issue of December 18th); and new metals, including 130-ton steels, titanium and plastics.

The Discussion.—PROFESSOR E. J. RICHARDS (University of Southampton), after welcoming the delegates to the University, went on to express approval of integral construction. He felt that increasing mechanical complexity was more of a nuisance than were complex structures; he wondered whether, now that something was known of the subject, more manual controls could not be provided in supersonic designs. He also discussed printed circuitry, the fact that it was better to mount engines, rather than fuel tanks, externally, and the possibility of replacing the cockpit canopy by a periscope. Replying, the lecturer said that powered controls were essential, but the *amount* of power was up to the designer. If an engine could be got into the wing, that was probably the best place. And in addition to the elimination of the canopy, the pilot himself ("an infernal nuisance") should be eliminated, once a machine capable of thinking had been developed.

MR. P. V. BROWN (M.o.S.) suggested that, as integral structures were best applied to larger aircraft, guided-weapon development might render them unnecessary. He mentioned magnesium-zirconium alloys, with which skin thicknesses could be doubled. He asked whether the elimination of joints might not make a structure too rigid and prone to fatigue. The lecturer replied



Two hypothetical Mach 2 aircraft used by Mr. Keith-Lucas to emphasize the difficulty of finding sufficient internal stowage volume for the large quantity of fuel and equipment required. The wings contribute little to this volume, particularly in the right-hand design, in which the thickness/chord ratio would be about 4 or 5 per cent.

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that integral construction was not confined to a particular size of aircraft, but was largely dictated by the intensity of end-loading per foot of stressed chord. Fatigue in integral structures might be more predictable than was at present the case, since the elimination of joints made the piece more nearly resemble a test specimen.

MR. F. E. JARLETT (student, College of Aeronautics) suggested that, at Mach 2, the only possible structural material was likely to be an alloy steel; materials such as D.T.D. 166, 138 or 389 were likely to give a wing from 10 to 40 per cent lighter than could be obtained with other alloys—and possibly with more interior space. Mr. Keith-Lucas replied that the use of steel might confer only a surprisingly small increase in permissible speed.

MR. R. E. MILLS (Bristols) referred to the need for detailed standardization, and also commented on the lack of "production designers"—a new type of person. The lecturer said that standardization was essentially the enemy of progress, but it had to be considered. He wished that every craftsman in an office could serve a proper apprenticeship in the shops; too often the apprentice went quickly into the drawing office.

MR. L. W. ROSENTHAL (Saunders-Roe) mentioned the difficulties of drawing modern structures and the fact that assembly of equipment was likely to be more difficult where the structure could not be broken down into constituent parts. He also brought up the problem of costing with regard to available man-hours, to which the lecturer replied that it was difficult to get at the truth, as his company had found when comparing production of the Canberra and Sturgeon; although the former aircraft required far more machining, the man-hours expended were much fewer, owing to the bigger production and better techniques. The secret was the rapid turnover in the machine shop.

A. CDRE. G. S. ROBERTS (M.o S.) favoured the placing of prototype orders followed by a small production batch defined by a stiff specification with a note to the effect that concessions would be allowed on early aircraft, provided that the last machine of the batch would be a representative production job.

MR. H. H. WILSON (Armstrong-Whitworth) said that Mg-Zr alloys were gradually being introduced, but were handicapped by their need for new plant and processes, such as hot-forming.

MR. A. VINES (Faireys) jolted the conference with some forthright words regarding capital investment on new equipment and processes in this country and the United States.

THE CHAIRMAN at this session, Mr. G. R. Edwards (managing director, aircraft division, Vickers-Armstrongs) commented that the British industry was "doing quite a lot" about which more would be heard in the fullness of time.

PRODUCTION PROBLEMS ARISING FROM THE TREND OF DESIGN

By G. H. Dowty, F.R.Ae.S., F.I.A.S., M.I.Mech.E., chairman and managing director, Dowty Group

OWING to the indisposition of the author, this paper—which dealt with its subject from the equipment manufacturer's viewpoint—was read at short notice by Sir Roy Fedden, of the College of Aeronautics board of governors. It divided airborne equipment into two main categories: items tailor-made for a particular aircraft, and standardized components. In the first category the paper dealt at length with undercarriage design, and several illustrations showed the effect of modern trends on the subjects of weight control and dimensional accuracy.

Modern production legs were machined throughout to maintain accurate weight-control, while higher tensile materials, such as 100-ton steels, were being used successfully. Six illustrations depicted respectively: a prototype undercarriage (forged light alloy billet 608 lb, finished leg 74 lb); the production counterpart of this undercarriage (die-forging 75 lb, finished leg 61 lb); a prototype leg for a well-known fighter (steel billet 538 lb, finished job 78 lb); a smaller fitting (die-forging 74 lb, finished 27 lb); the main cast member for the bogie undercarriage of a well-known bomber (Mg-Zr casting 489 lb, finished 439 lb); and finally the corresponding member for the nose undercarriage of the same aircraft (306 lb as cast, 281 lb finished). The inference regarding the amount of machining required by forgings as opposed to castings was obvious, although the finished job might be heavier when cast, owing to poorer material characteristics.

The paper then turned to various aspects of the quantity production of close-tolerance equipment. Typical of the problems was the fact that, on a current fighter undercarriage, the angle between the retraction shaft and the axle was held to a tolerance of plus or minus five minutes of arc, this tolerance being affected by four separate details. Weight reduction was another factor to be considered, and light-alloy parts were now being substituted for steel, frequently by giving them a coating of a very hard anodic film, which had better wear-resistance than hard chrome plating. A similar process was now being carried out on magnesium.

The production of standard equipment, such as fuel pumps, burners, and hydraulic pumps, was then described, and particular reference was made to the methods by which tolerances of the order of 0.0002in were obtained.

The Discussion which followed dealt with Mr. Dowty's paper and also with that presented by Mr. S. P. Woodley, which we summarized last week. There appeared to be no specific questions directly aimed at Mr. Dowty's paper, although Sir Roy Fedden replied, on his behalf, to general questions as indicated in our last issue.

USER PROBLEMS AFFECTING THE INDUSTRY

By Air Marshal Sir R. Owen Jones, K.B.E., C.B., A.F.C., Controller of Engineering and Equipment, Air Ministry

AFTER drawing a lurid picture of the exasperating behaviour of the Royal Air Force as a customer, Air Marshal Sir R. Owen Jones described the manner in which servicing was carried out in the R.A.F., in which on-the-spot rectification was effected wherever possible, second-line servicing took place on the station, and third- and fourth-line servicing required facilities and test gear available only at Maintenance Command bases or the manufacturer's works.

Turning to the subject of modifications, the lecturer said that the situation had changed considerably in recent years, and we were now faced with the production of extremely complex aircraft "off the drawing board." Although the lecturer felt this to be a fine concept, and did not advocate a return to the old procedure of building an aircraft and improving it before buying it in quantity, ordering off the drawing board inevitably threw an enormous load on to the Services in respect of modifications.

As well as the Boscombe Down trials, the R.A.F. now conducted intensive flying trials on the first deliveries of a new type, in the course of which eight aircraft put in a thousand hours' flying in the shortest possible time. This had been most valuable, although the work was handicapped if early deliveries were not fully complete aircraft. An example was a single-seater, now coming into service, which could require as much as 800 man-hours of B.2 modification outstanding on each machine at delivery, with the certainty of a like amount to come in the future. Incorporating modifications on this scale was an immense burden and was detrimental to the nation from every point of view.

The air marshal then indulged in some plain speaking on the subject of spares—"literally our life-blood"—which had haunted him ever since he became responsible for them. The maintenance spares should come along with the first aircraft, and should then match the subsequent production. In no aircraft instance had these spares been "100 per cent on the nail." Nothing was more discouraging to the Service than to have fine new aircraft

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grounded through the lack of a spare costing only £5 or £10.

It sometimes happened that an aircraft became seriously damaged—by a belly landing, for example—long after normal production had ceased. The lecturer spoke highly of an American company which maintained what they called the "short-order shop" in which was carried out unforecastable production arising after normal production had ceased. This firm had made a special study of the disposal and storage of the tools from the old production line with a view to the most efficient and speedy production of a few-off when the demand arose.

The final sub-headings of this paper were: interchangeability, accessibility, new fabrication techniques, stress concentration, inspection and production. Throughout, it was apparent that modern production techniques were likely to prove something of a problem, both from the point of view of inspection and repair.

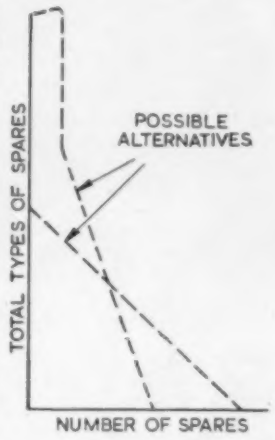
The Discussion.—W/C. L. P. GIBSON (R.A.F.) raised a number of points, including the difficulty of providing sufficient tankage for all types of military aircraft, the severe airfield requirements of machines with high tyre-pressures, and the fact that an eye had to be kept on crew-survival problems.

PROFESSOR J. V. CONNOLLY (College of Aeronautics) said that the present period of some seven years which elapsed between design and production was not much greater than obtained before the war; he suggested that notable exceptions to this rule were the Mosquito and Meteor, and pointed out that the compulsory modifications on the former aircraft had been no more numerous than usual. The lecturer replied that the fact that the Mosquito had a wooden structure might have a bearing on its quick entry to service.

Replying to MR. R. E. MILLS (Bristols) Sir R. Owen Jones went on to stress the need, in combat aircraft, for ruggedness rather than fine engineering, particularly in such items as landing gear and door mechanisms.

PROFESSOR E. J. RICHARDS (University of Southampton) suggested that America might be able to develop aircraft quickly owing to the fact that they could afford a bigger wastage-rate. He went on to suggest the production of "unlikely" spares while the aircraft was in production, instead of waiting until they were needed. The lecturer agreed that the American tendency was to attack on a bold front, while Great Britain was forced to think hard for perhaps a year and then attack with all her resources along a particular line of development. Regarding spares, he said that various schemes had been tried, such as the ordering of ten complete aircraft as spares. Turning to the blackboard, he produced a sketch [see above] and commented that it was very difficult to decide in advance what the insurance rate was going to be. The dotted lines in his diagram showed possible spares provision rates for all the components of the aircraft, those components occurring at the top of the vertical ordinate being of a type for which little or no spares provision was expected.

Air Marshal Sir R. Owen Jones drew a diagram to illustrate the choice available between variety of spares and the number of spares available of each type.



MR. F. R. ELLIOTT (Armstrong-Whitworth) suggested that the aircraft should be designed as an empty shell and test-flown in this form to prove the aerodynamics while the equipment was being developed.

MR. A. E. WOODWARD-NUTT (M.o.S.) "profoundly disagreed" with this contention, saying that the aircraft and its equipment must be integrated as one. A particular problem for his department was "when should the order be placed?"—since the aircraft might be on the drawing-board for up to five years. He felt that the best solution was to order a design and a working mock-up of many types to a given specification, after which two types would be selected and 20 to 30 development aircraft produced on production jigs at a slow rate, so that the final one was a full production machine.

The conference closed with an address—in general but characteristically witty terms—by Sir Frederick Handley Page, at a session during which Mr. W. C. Puckey (now Sir Charles Puckey), president of the Institution, took the chair.

BEAVERS SOUTH

SOME 32 D.H.C. Beavers have now been delivered to South America from Canada. A recent delivery flight of three to Colombia has been described by Mr. Jack H. Ford, president of Fleetway, Inc., whose pilots carried out the operation.

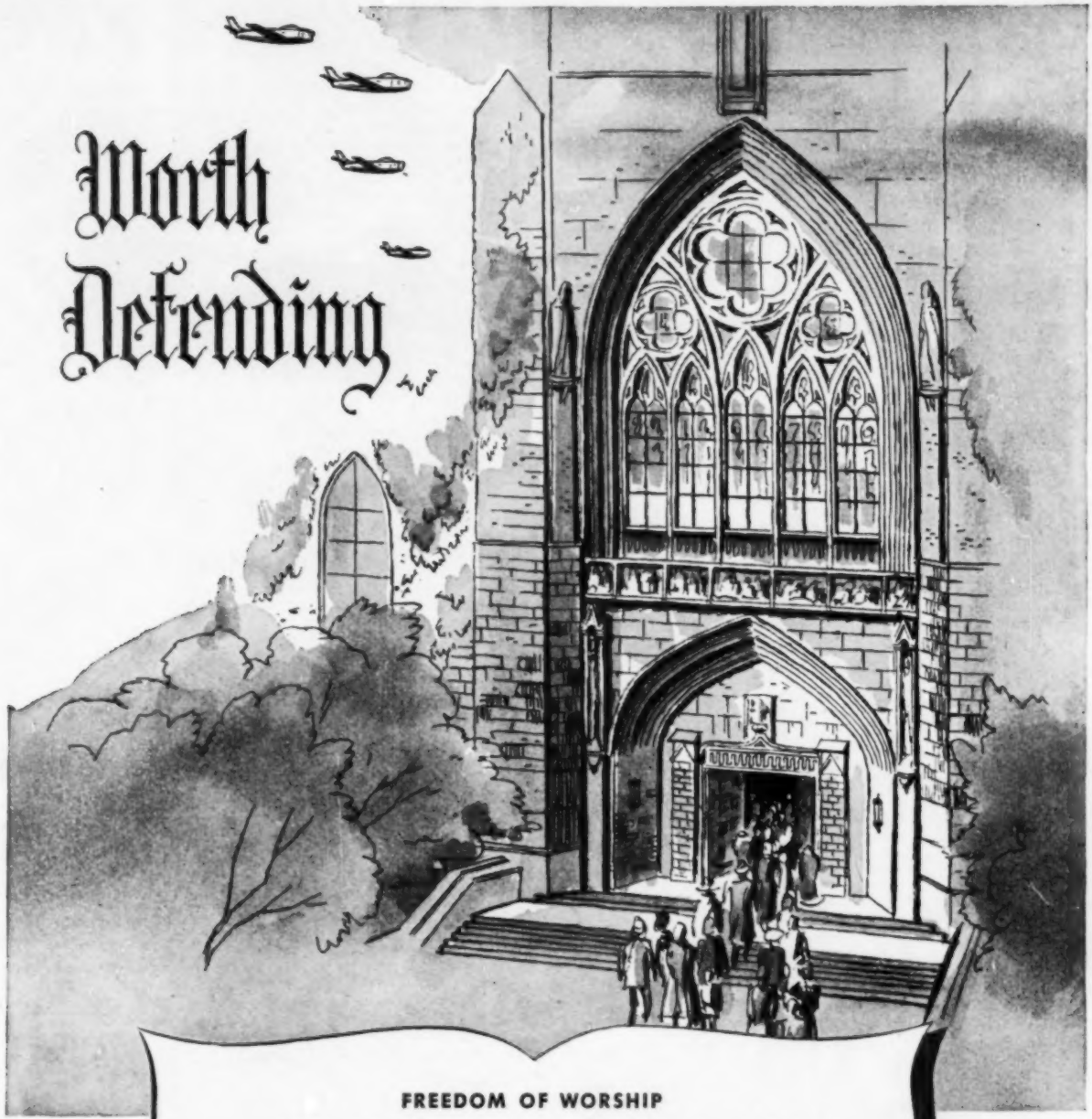
The three aircraft left Malton, Ontario, where they cleared Customs, only 25 minutes after taking off from D.H.C.'s Downsview airfield. They crossed the lake to Buffalo where the crews cleared U.S. Customs and dined. The next leg took them by night along the air routes *via* Lumberton, N.C. (where they refuelled), Savannah and Melbourne, Florida to Miami, where they arrived at 0600, an hour after sunrise. The pilots reported that they found the Beavers stable and pleasant to handle on instruments at night. During the morning they took off for Kingston, hoping to fly on to Bogota that day, but they were held up at Kingston for the night.

Next day took them to Barranquilla for refuelling and final Customs clearance, and they then set off on the last leg to Bogota; this was flown between 9,500ft and 11,500ft I.F.R. "on top." The Beavers were controlled by Bogota radio and Techo approach, the let-down being made straight in from the Germanorlano Los Andes control point.

The Beavers landed at Bogota at 1600 hr on the third day and were demonstrated and finally handed over at the Madrid Air Force Base the following day.

Eager Beavers: Fleetway pilots Al Wells, Jack Ford and Ray Hecox, all ex-U.S. Marine pilots, man their aircraft at the start of their delivery flight (see above) from D. H. Canada's Downsview airfield to Bogota, Colombia.

Worth Defending



FREEDOM OF WORSHIP

This week millions will go to church, chapel, cathedral and synagogue — without coercion, without having asked anyone's permission — or more significantly, without a look over the shoulder for secret police.

It was not so in the lands which suffered Nazi occupation; it is not so in many countries today... it will not be so if totalitarianism spreads.

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THE INDUSTRY

Avro Apprentices Rewarded

AT the recent prize-giving to Avro apprentices, held in Manchester, the Avro 504 Club Trophy for the best all-round apprentice of the year went to I. J. Goldberg, who is now a member of the firm's technical staff. Two runners-up for the Trophy, and one other fifth-year apprentice, have entered the College of Aeronautics at Cranfield for the two-year post-graduate course in aeronautical engineering; they are J. B. Sutcliffe, A. J. Walton and R. Nichols. Like other Avro apprentices continuing training at colleges they will receive their full rate of pay for their age, enabling them to pay their fees and have enough left to live on. Fourteen other apprentices received cash prizes:—

Fifth year, M. O'Connor (engineering apprentice), G. S. Wood (trade). *Fourth year*, R. A. Gellatly (engineering), H. Morris (trade). *Third year*, E. G. Crabtree (engineering), K. J. Byrne (trade). *Second year*, R. Tetlow (engineering), A. Richardson (trade). *First year*, D. Russell, A. Hillgrove (trade), F. Byron (trade). *Progress Prizes (first year only)*, F. Senior (trade), N. V. Evans (trade), D. K. Daniels (engineering).

A Reading Celebration

OVER 220 members of the staff of Western Manufacturing (Reading) Ltd., with their wives, were present at the company's annual staff dinner and dance at Reading.

Mr. F. V. Waller (managing director) reviewed the past year's expansion, also giving an inkling of the many new projects on hand; and Mr. S. R. Hogg (chairman) thanked the directors and staff for their loyalty to the company over the past few years.

Mr. M. G. Herrington, managing director of High Duty Alloys, Ltd., replied on behalf of the guests, stating that he had watched with amazement "the extremely rapid growth of the company in an unbelievably short space of time." Mr. M. R. Chetwynd, on behalf of the staff, thanked the directors for the party.

Prize-Day for Percival Apprentices

THE annual presentation of awards to Percival apprentices was held recently in the main canteen at the Luton factory. Mr. W. A. Summers (managing director) made the presentations and also addressed the apprentices, taking as his theme two aspects of their training: technical education and teamwork. He advised them not to regard their technical studies as something they would never have to use—in fact, they would find occasions when they would need to use all their knowledge. He stressed that in industry, and certainly in the aircraft industry, individualism was less important than good teamwork. That Percivals had grown during the last fourteen years from a small company building relatively few aircraft for private ownership to their present position of producing large numbers of Service trainers had been due to sound teamwork on the part of all concerned.

The apprentice supervisor, Mr. H. G. Hammond, in presenting his annual report, said that the apprentice strength was now 103, comprising two students, 40 engineering and 61 trade apprentices. Twenty-two ex-apprentices were in the Forces.

The guest speaker was Mr. W. F. Stephenson, Principal of Luton Technical College. Prizewinners were as follows:—

Best All-round Apprentice, B. J. Beasley. *Best Technical Apprentice*, D. J. McNally. *Best Practical Apprentice*, B. W. Clark. *Ordinary National Certificate*, W. S. Clayton. *City and Guilds Intermediate Machine Shop*, B. J. Beasley, B. W. Clark, K. M. Poulter, K. G. Mead, T. P. King. *City and Guilds Electric Installation*, L. G. Haynes. *City and Guilds Intermediate Photography and I.B.P. Preliminary*, W. R. Rainbow. *Lawes Rabjohns Prize for Draughtsmanship*, B. J. Beasley; runner-up R. A. Cooper. *Hundred per cent time-keeping*, B. S. Ashby, A. R. Brown, W. A. Cheeseman, G. E. Pons, J. A. Wathew, H. R. Watkins, P. Wells, K. W. Woodbridge, B. R. Woodcock.

PERCIVAL PRIZE-GIVING: On the left, Mr. W. A. Summers, managing director, presents an award to B. J. Beasley, best all-round apprentice; seated are Mr. F. W. Buglass (works manager) and Mr. W. F. Stephenson (Principal, Luton Technical College); beyond the microphone is Mr. H. G. Hammond (apprentice supervisor).

SIR ROY DOBSON, Avro managing director, presents the 504 Trophy to I. J. Goldberg. (See "Avro Apprentices Rewarded".)

IN BRIEF

Publication No. 654 of the Plessey Co., Ltd., Ilford, Essex, contains data and drawings concerning the various radio drives and couplings made by them; issue is confined to radio-equipment manufacturers.

* * *

Hall and Hall, Ltd., Oldfield Works, Hampton, Middlesex, have been granted M.o.S. approval for low-pressure non-fire-resistant fuel hose to Spec. D.T.D. (RD1) 3951; this hose will be known as "Maricon" Type A.

* * *

Mr. A. Healey, an executive director of Dunlop Rubber Co., Ltd., is retiring after more than 38 years' service with the group. Mainly associated throughout this period with research, development and production, he became a director in 1942.

* * *

Until now general service manager, Mr. R. W. Cantello has been appointed a director of Airwork General Trading Co., Ltd. (an Airwork subsidiary). Between 1929 and 1939, when he joined the organization, he held posts with Avro, Fairey, de Havilland and Airspeed.

* * *

Mr. Paul Evans has been appointed manager of the Scandinavian division of Hoover, Ltd., with H.Q. in Copenhagen. A Regular officer of the R.A.F. before the war, he rose to the rank of wing commander in Fighter Command; he was C.O. of the Malta Night Fighter Unit and later of No. 239 Sqn. (Mosquitoes) and of R.A.F. Station Croydon. After the war he joined B.E.A.

AT A CHRISTMAS PARTY held by Titanine, Ltd., 14 employees with upwards of 20 years' service were presented with gold watches; Mr. J. Bridges (manager, service department) is seen receiving his award from Mr. G. W. R. Ward (managing director), on the right.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Fogs and L.A.P.

HERE we are in the fog season again, although it has not been a bad winter in most places, and all the perennial news about cancelled and delayed services, and the number of aeroplanes that have not landed, is back in the papers with the usual estimates of revenue-loss to B.E.A. and the others because of the weather. Even a two-day strike stopping services to Paris costs £30,000, so what is the price of day after day of fog at London?

It has been the same every year, although in another sense it is getting worse because more and bigger airliners are held up as time goes on. Why is there still no Fido or other device to get rid of the fog at London Airport? I have read that Fido costs hundreds of pounds an hour to run, but probably not as much as it costs the airlines, if we can believe the figures for the losses that are blamed on the fog we do not disperse. Also I sometimes think of the cost of petrol as I hear the big machines droning round above waiting for their turn to land.

My brother, who used one of the first Fidos in the R.A.F. during the war, told me he thought it was quite safe even then, and that it not only cleared the fog but got you down more quickly at night by lighting up the whole airfield and giving the pilot something to aim for.

The Government are going to have to do something about this fog one day, and I say the sooner the better, because each winter not only adds to the total of lost fares but also to the price for putting in Fido, or something like it, labour and material costs increasing as they do.

Staines, Middlesex. R. WILLIAMS.

Unproductivity

MY 15-year-old son, an ardent aircraft modeller and enthusiastic reader of *Flight*, knows of my interest in productivity, and has always been a little cynical about it all. You can therefore imagine his delight, when thumbing through the pages of the Christmas Number of your magazine, to come across the article headed "Unproductivity"; you may rest assured he lost no time in drawing my attention to it.

Having read it, I must say that I was highly entertained, and thank you for reminding those of us who are protagonists of productivity that we should not take ourselves too seriously all the time.

E. L. TUFF,
London, S.W.8. Chairman, S. London Committee,
British Productivity Council.

PROFESSOR McGILLICUDDY'S interesting thesis in your Christmas Number is both lucid and convincing, but is too verbose (he must have received his legal training in a U.S. Patent Attorney's office). In effect, the whole thing is governed by the Second Law of Thermodynamics, which, besides being incontrovertible, incomprehensible and reprehensible, is recognized as being *inevitable*, and in its most general form is best expressed by the statement "Every day and in every way everything (and everybody) becomes more and more disorderly."

A famous Fabian laid down the principle of the "inevitability of gradualness," but the Productivists (whose avowed aims are antidisorderly), in attempting to set up a false ideal of gradualizing the inevitable, are not only being reactionary (and, indeed, Fascist beasts) but are interfering with natural laws. This is Hubris and will inevitably attract Nemesis in the form of take-over bids by Unproductivist syndicates, who (rightly) realize that assets can better be employed in promoting disorderliness by dissipating them in riotous living.

With most cordial wishes to Professor McGillicuddy and to yourself, Sir, for an utterly riotous New Year.

MAX. ENTROPY,
Former Professor of Misapplied Thermodynamics.
University of Bogus (MittelEuropa).

Bard of Avon

CONGRATULATIONS to the author of the Shakespearian supersonic epic in your pre-Christmas issue. This was a brilliant effort, and I think your printers—who, I presume, were responsible for the very convincing antique type, and the general appearance of this "historic document"—also deserve applause.

Incidentally, I am wondering if by any chance it was "Neville the Dyke" who aimed that much-publicized supersonic bang south of London's river on (I think) the very day that article appeared. Maybe, in retaliation, he sought to "Affright the fimple yeomanry" in your editorial offices?

Liverpool. D. SMITH.

Gay Firefly

THE reference in "Aircraft Intelligence" in your issue of December 18th to a red and yellow Firefly 7 seen at Farnborough reminds me of an interesting aircraft I saw at Croydon about 1936. It was an R.A.F. Monospar S.T.25, serialled K.8308, which, if memory serves me rightly, had a red fuselage with yellow wings and tail unit. The galaxy of wireless equipment aboard indicated experimental work in the radio field.

The suggestion in your note that this colour scheme might be connected with pilotless aircraft gives interesting food for thought, as the cruising speed of the Monospar would have been about the same as that of the Queen Bees then in use as anti-aircraft targets. I am not sure of the size or the weight of the transmitters which were used to control the Queen Bees, but it might have been possible to install a set in the cabin of the Monospar. I never heard of Queen Bees being guided from another aircraft, but it is a possible explanation.

Wraysbury, Bucks. H. E. SCROPE.

FORTHCOMING EVENTS

Dec. 31-Jan. 13. National Schoolboys' Own Exhibition, Horticultural Halls, Westminster.
Jan. 9. British Interplanetary Society (North-west Branch): "Our First Goal—the Moon," by P. A. Moore, F.R.A.S.
Jan. 12. Institution of Civil Engineers: "Control of Movement at Airports," by Clifford Hayes and E. J. Dickie.
Jan. 15. Institute of Navigation: "Methods of Air and Surface Navigation," by W/C. E. W. Anderson, D. H. Sadler, Lt. Cdr. R. B. Michell, R.N., and G/C. E. Fennessy.
Jan. 16. British Interplanetary Society (Midlands Branch): Brains Trust.
Jan. 16. British Interplanetary Society (Provisional Yorkshire Branch): Short-paper evening and Brains Trust.
Jan. 18. Photogrammetric Society: "New Stereoscopic Plotting Instrument for Aerial Photographs," by Professor E. H. Thompson.
Jan. 21. R.Ae.S. Main Lecture: First Mitchell Memorial Lecture, by J. Smith, C.B.E., F.R.Ae.S. (at Southampton).
Jan. 22. Helicopter Association: Brains Trust.
Jan. 23. British Interplanetary Society (Provisional Western Branch): "Astronautics in the Next 25 Years," by E. Burgess, F.R.A.S.
Jan. 23. Aircraft Recognition Society: All-England Recognition Contest, Royal Institution, London.
Jan. 26. R.Ae.S. Section Lecture: "X-ray Metallography," by Dr. G. L. J. Bailey.
Jan. 25-29. Institute of the Aeronautical Sciences: 22nd Annual Meeting, New York.
Jan. 27. R.Ae.C.: Dinner to 1953 Air Racing Champion and winner of King's Cup.
Feb. 4. R.Ae.S. Section Lecture: "Air Intake Efficiency," by F. B. Greatrex, B.A., A.F.R.Ae.S.
Feb. 5. Photogrammetric Society: "New Plotting Machine for Air Photographs," by J. E. Odle.
Feb. 6. British Interplanetary Society: "Progress towards Astronautics," by K. W. Gatland.
Feb. 10. Radar Association: "Secondary Radar," by K. Harris.
Feb. 11. R.Ae.S. Main Lecture: "Recent Developments in the Structural Approach to Aeroelastic Problems," by Dr. D. Williams, M.I.Mech.E., F.R.Ae.S.
Feb. 13. British Interplanetary Society (Midlands Branch): "Astronautical Physics," by N. H. Langton, Ph.D.
Feb. 13. British Interplanetary Society (Provisional Yorkshire Branch): "Some Experimental Work on Rockets," by D. N. Hunter.
Feb. 18. R.Ae.S. Section Lecture: "Helicopter Research," by F. J. O'Hara, A.R.Ae.S. (jointly with the Helicopter Association).
Feb. 20. British Interplanetary Society (North-west Branch): "Building the Lunar Base," by R. A. Smith.
Feb. 27. British Interplanetary Society (Provisional Western Branch): "Provisioning of Interplanetary Vehicles," by G. L. Garthwaite.
Mar. 2. R.Ae.S. Section Lecture: "Metal Sandwich Construction," by F. Tyson, B.A., A.F.R.Ae.S.
Mar. 4. R.Ae.S. Main Lecture: First Barnwall Memorial Lecture, by Major G. P. Bulman, C.B.E., B.Sc., F.R.Ae.S. (at Bristol).

R.Ae.S. Branch Fixtures (to Jan. 27).—Jan. 11, *Birmingham*, joint meeting with Institute of Rubber; *Halton*, "The Propeller Gas Turbine," by A. C. Clinton. Jan. 13, *Hatfield*, "Stability and Control in Aircraft Design," by J. C. Wimpenny; *Weybridge*, "Sailplane Design," by K. G. Wilkinson. Jan. 14, *Isle of Wight*, "Large Press Forgings," by E. T. Stewart-Jones. Jan. 15, *Glasgow*, "The Pilot's Point of View," by Officers of Glasgow U.A.S. Jan. 18, *Halton*, Branch Night. Jan. 19, *Belfast*, "Flight Testing Problems," by D. N. Scard. Jan. 20, *Bristol*, "Design Problems of the Transport Helicopter," by R. Hafner; *Coventry*, "Recent Developments in Gliding," by A. H. Yates; *Leicester*, A.G.M. and Film Show; *Manchester*, Lecture; *Preston*, "Stability and Control of Delta Wing Aircraft," by W/C. R. J. Falk. Jan. 21, *Southampton*, Main Lecture (see above). Jan. 25, *Halton*, Junior Members' Night. Jan. 27, *Weybridge*, "Space Flight," by J. Humphries.

CIVIL AVIATION

LONDON-MADRID BY VISCOUNT

SPAIN became the eleventh overseas nation served by B.E.A. Viscounts on Saturday, when G-AMOL *David Livingstone* (Capt. E. R. Wright), carrying 28 passengers, flew from London to Barajas, Madrid, in 2 hr 30 min—an average speed of 310 m.p.h. On Monday, exceptionally strong tailwinds enabled Capt. H. C. Bailey, flying the same Viscount, to break this short-lived route record: averaging 354 m.p.h., he completed the journey in 2 hr 11 min. These speeds, incidentally, are based on the great-circle distance of 774 miles; the distance actually flown was nearer 810 miles, giving still better ground-speeds.

Vikings formerly operated the London-Madrid service, calling *en route* at Bordeaux and taking just over 5½ hr; Viscounts are scheduled to take 3½ hr for the outward journey when flying direct (on Mondays, Thursdays and Saturdays). There is no service on Sundays and Wednesdays, and the Tuesday and Friday flights are made *via* Bordeaux.

HELICOPTER DEVELOPMENTS

ACCORDING to a report from New York, all of the airlines now operating scheduled flights across the North Atlantic have signed or are negotiating agreements enabling their passengers to use the inter-airport helicopter shuttle service run by New York Airways between Idlewild, La Guardia and Newark. The first company to do so was S.A.S., which concluded its interline agreement with New York Airways on August 7th. Similar agreements are now in operation between the helicopter company and Air France, P.A.W.A. and K.L.M.

New York Airways have a fleet of seven Sikorsky S-55s. On the La Guardia-Idlewild-Newark route there are 12 services daily and 14 services are operated in the return direction. Single fare for the journey from the International Airport (Idlewild) to La Guardia is $5 (£1 15s 9d) and between International and Newark the fare is $10 (£3 11s 6d). Flight times on these two routes are, respectively, 10 min and 20 min. Although passengers are now carried, the services are still intended primarily for mail traffic: six passengers are carried on each of two daily services and payload for the remainder consists of two passengers plus mail.

Other news of helicopter development comes from the city of Rotterdam, which has just created its own "helicopter syndicate," presided over by Mr. C. Kolff, a member of the Rotterdam Chamber of Commerce. Since the destruction of Waalhaven Airport, Rotterdam has had no direct air communications, a fact which is regarded as a serious setback to the development of this world port. Sabena's introduction of regular S-55 services from Brussels has now provided it with its first connection to the European domestic and international network. The Rotterdam syndicate regards a service linking the city with the national airport of Schiphol as essential, and urges that K.L.M. should follow the lead set by Sabena in opening a helicopter network.

EXECUTIVES of Hunting-Clan Air Transport, Ltd., subject of the article on pages 45-46, are Mr. H. G. Matheson (left), scheduled-services manager, and Mr. R. Wingrave, charter manager. Mr. Matheson represented the company at the I.A.T.A. traffic conference in Honolulu.

PARIS is the setting for this new study of a Sabena S-55, flown by Capt. A. Vernieuwe, the airline's operations manager. On December 20th, with four passengers aboard, it covered the 160 miles from Brussels in 2 hr 10 min. Regular services are expected to begin by the spring.

SOUTH AFRICAN AIRPORT COMPLAINTS

WRITING on the new Jan Smuts Airport at Johannesburg, a South African correspondent reports that visitors frequently complain about the generally brusque treatment they receive there on arrival, and particularly about the delay in being cleared through Customs. One business man gave the following account of his experience of the new terminal: "When I travelled from Rome recently we touched down at Jan Smuts at 6.45 p.m. No one was allowed to leave the aircraft for 15 minutes while it was being sprayed. . . . Then I had to wait for 45 minutes in a cheerless reception lounge until my turn came to be interrogated by the customs officials. There was no opportunity to buy refreshments . . ." Our own brief experiences at Johannesburg airports confirm that there is room for improvement of passenger-handling methods.

NEW LIGHTING AT L.A.P.

TO provide pilots with guidance during the final stages of approach over high intensity cross-bar lighting, short bars of incandescent lights are being installed along the first 2,000ft of Runway 10R at London Airport. The bars are being placed at 500ft intervals along the runway, with the innermost lights 100ft from the centre-line, and will thus continue the horizontal guidance provided by the cross-bar Calvert approach lights. An experimental system along these lines was tried out last winter.

Each light will be less than 12in above ground level and will be attached to the runway by a weak link to prevent damage to aircraft if struck. Red obstruction lights will mark their position in conditions which do not call for use of the high intensity system, or when the runway is being used in the 28 direction. For the next three months experimental flights will be made in bad visibility to determine the optimum angular setting for the lights. Meanwhile, pilots are being asked to give their comments on the system to the assistant commandant or to air traffic control.

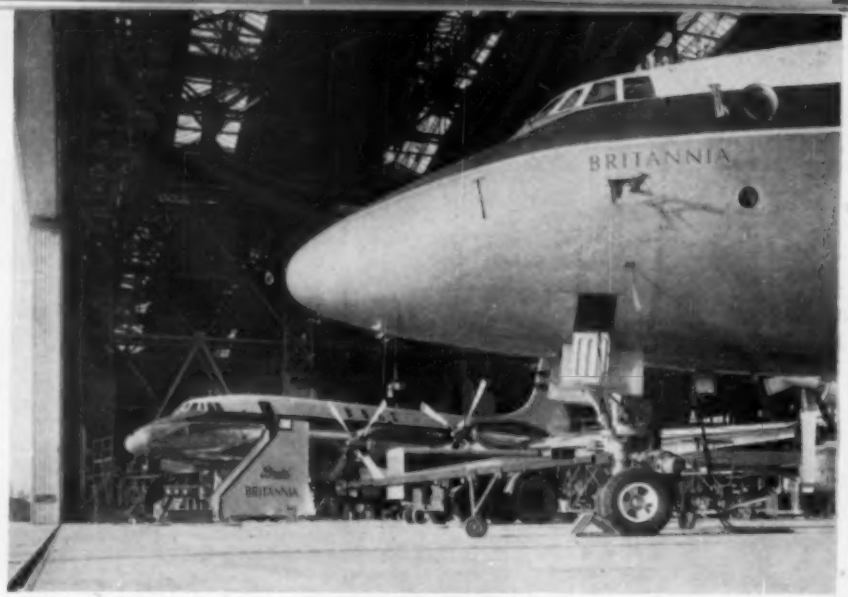
U.S. AIRLINES' RECORD YEAR

THE year 1953 was a record year for U.S. aviation, with more traffic but fewer accidents, better safety devices and far-reaching engineering developments, according to an annual survey just issued by the Civil Aeronautics Administration.

Domestic and international airline travel increased by 17 per cent—from 27,385,276 passengers in 1952, to 31,981,000 in 1953. As shown by the I.C.A.O. figures overleaf, this is well over half the total carried by the world's airlines. The civil-aircraft output of U.S. manufacture increased by 22 per cent—from 3,509 aircraft in 1952 to 4,290 last year. Landings and take-offs handled by C.A.A. airport control towers were more than 17,000,000, compared with 15,814,213 during 1952, and *en route* traffic increased correspondingly.

Twenty more instrument landing systems were installed, together with seven airport surveillance radar systems, 16 D.M.E. systems and nine V.H.F. omni-directional radio ranges.

The C.A.A. approved the first U.S. transport aircraft with turbo-compound engines: the Lockheed 1049C Super Constellation and the Douglas DC-7. The C.A.A. also issued certificates or special ratings to 35,350 airmen, an 11 per cent increase over 1952. This figure included 16,685 student pilots, 1,556 airline transport pilots, 1,344 helicopter pilots, 3,237 mechanics and 2,096 traffic control officers.



SISTER SHIP: During the last week of 1953 the original Bristol Britannia (foreground) was joined on flight trials by a second prototype; both are seen in this recent view from Filton. The first production Britannias should reach B.O.A.C. later this year for revenue service in 1955.

CIVIL AVIATION . . .

CO-ORDINATING EUROPEAN AIR TRANSPORT

DELEGATES of 20 major European nations will take part in the conference, beginning at Strasbourg on April 21st, called by I.C.A.O. to discuss methods of improving commercial and technical co-operation between the airlines of Europe. The Federal German Republic will be represented, but there will be no delegate from Iron Curtain countries. All non-European I.C.A.O. member states have been invited to send observers to the conference, and similar invitations have been sent to 13 international organizations, including I.A.T.A.

Efforts to achieve multilateralism in the exchange of traffic rights have been made at regular intervals ever since the original post-war Chicago Conference, but none has succeeded. The Strasbourg conference represents an approach towards the problem on a regional basis. The agenda calls first for an examination of existing bilateral agreements in Europe with a view to eliminating or modifying any restrictive provisions.

Under the heading of "exchange of traffic rights" delegates will also discuss the possibility of introducing interchange services as widely practised in the United States. "Interchangeability" is defined in the agenda as "the ability of an airline, operating internationally under a governmental agreement or authorization, to use an aircraft belonging to a foreign airline and registered in a foreign state, with or without the aircraft's crew."

Interchange services can provide a simple way of increasing aircraft utilization, which is generally low on European short-haul networks, and this aspect will receive particular study at Strasbourg. Delegates will also discuss possible adaptation of Customs procedures to permit better co-operation between airlines in both the maintenance and operation of aircraft. Two final items on the agenda are "examination of other measures calculated to reduce ground-stop time" and "air navigation facilities in Europe." Under the latter heading, the conference will determine the extent and results of delay in the implementation of I.C.A.O. regional plans.

PANAM'S FREIGHT PLANS

REGULAR transatlantic all-freight services will be resumed by P.A.W.A. this year, following the delivery of three DC-6As, each capable of lifting 26,000 lb compared with the 14,000 lb payload of the DC-4s formerly used. The airline expects to operate at least two cargo flights weekly—"three if the business requires more." PanAm's freight capacity is being increased by 50 per cent in 1954, providing for a total of 10m lb.

NEW SERVICES APPROVED

CONDITIONAL approval of the following domestic and international scheduled services is announced by the M.T.C.A.:

B.K.S. Air Transport: an inclusive-tour service between Newcastle and/or West Hartlepool and Bembridge, Isle of Wight; an inclusive tour service between Newcastle and/or West Hartlepool and Tarbes (for Lourdes) *via* Jersey or Hurn (technical stops). Both services are approved until September 30th, 1954.

Silver City Airways: a vehicle-ferry service between Blackbushe or Lympne and Kloten, Zürich, for the period January 1st-March 30th, 1954.

The following amendments to existing services have also been approved: (a) Operation of terminating services between Southampton and Paris by Cambrian Air Services on their route Cardiff and/or Bristol-Southampton (on demand)—Paris; (b) operation of terminating services between Hurn and Guernsey and/or Jersey by Jersey Airlines on their route Manchester and/or Coventry-Bournemouth-Guernsey and/or Jersey-Dinard-Rennes-La Baule.

LONDON-MIDWEST DIRECT

ON May 1st, 1954, Pan American World Airways are to inaugurate direct DC-6B services between London and Detroit and Chicago, by way of Shannon and Gander. These will be followed in June by a similar service from Stockholm, Copenhagen, Hamburg and Prestwick. They will take 21 hr 15 min for the 3,949-mile flight from London to Chicago and 18 hr 50 min for the 3,754 miles to Detroit. At present the company's plans involve only tourist-class services on the new routes.

WORLD AIRLINE TRAFFIC IN 1954

ON average, a million passengers flew on scheduled airline services in each week of 1953. According to end-of-year statistics published by I.C.A.O., the average distance flown by each of the 52m passengers during the twelve months was 550 miles and the average number of passengers per aircraft was 24.5. As in previous years the I.C.A.O. traffic figures exclude Chinese and Russian airline statistics.

The difference between last year's passenger total and that for 1952 (45 million) represents a gain of 16 per cent, compared with increases of 13 per cent between 1951-1952 and 28 per cent between 1950-1951 (an exceptionally good year for most airlines). The total distance flown on scheduled services last year was 1,170m miles, 10 per cent more than in 1952, and passenger-miles flown last year amounted to 28,580m, an increase of 16 per cent. Ton-mile totals for cargo and mail were, respectively 700m and 185m, increases of 7 per cent and 5 per cent.

Between 1937 (when approximately 2.5m passengers flew on the world's airlines) and 1953 the number of passengers has thus increased by nearly 2,000 per cent. The corresponding increase in total distance flown is just over 600 per cent, indicating that a significant proportion of this vast increase in airline traffic has been on the shorter-haul routes. This trend is emphasized by figures showing average distance flown per passenger over the years. In 1937 this distance was 350 miles; the figure for 1947 was nearly 60 per cent greater—559 miles—but it decreased slightly in subsequent years and in 1951 the average passenger journey was 536 miles. The 10 per cent rise between 1952 and 1953 in the total distance flown by aircraft was accompanied by an increase of only 1 per cent in the average passenger journey. The number of passengers per aircraft was only 5.3 in 1937; with the introduction of large post-war aircraft there has been a gradual increase each year over the 1947 average of 16.6, so that the "average airliner" of today carries more than 3¼ times the complement of its 1937 counterpart.

Scheduled airline traffic in 1954 can be expected to increase by 10 per cent, according to a statement issued at the end of December by Sir William Hildred, director-general of I.A.T.A. (whose 69 member airlines carry about 85 per cent of all scheduled air traffic). He added that because of lower fares, extensive re-equipment costs and decreased airmail payments, operators could not expect a fully equivalent rise in their revenues; the balance of airline finances would remain "generally precarious." As an illustration of the airlines' "constantly creative attitude towards rates and fares," Sir William quoted the fact that completion of the world-wide tourist network in 1954 will make it possible for a traveller to circle the globe over a choice of routes on a single tourist-class ticket costing slightly less than £400. The year ahead, he estimated, would see the introduction of some 300 new airliners.

A straightforward example of the major contribution made by the shorter-haul airlines towards the overall increase in traffic is contained in the provisional results published by B.E.A. The Corporation carried 1,638,000 passengers in the calendar year ended December 31st, 1953, nearly 24 per cent more than in 1952. The peak month, incidentally, was August, when more than 250,000 passengers were carried. By comparison, the corresponding increase in B.O.A.C.'s passenger traffic was just over 5 per cent —from 273,000 to 287,000. K.L.M., who operate both regional and long-haul services carried 604,000 passengers in 1953, an increase of 17 per cent. The Dutch airline reports that the introduction of tourist fares brought a 20 per cent increase in passenger traffic on its European network. Comparable traffic increases were achieved by T.C.A., whose aircraft carried 1,300,000 passengers, some 15 per cent more than in 1952.

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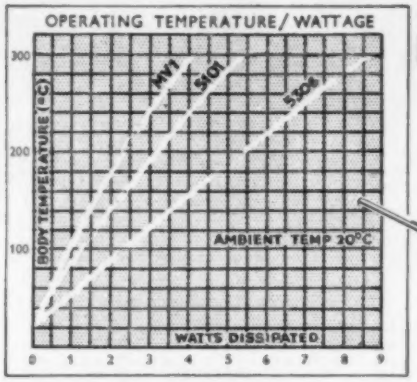

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Standard	MVI	1 10	9.99 4,700	10% 5%	4	3	300 °C.	BELOW 100°— NEGLIGIBLE ABOVE 100°— 0.01% /°C.	15/32"	13/64"	1¼"	20 S.W.G. Silver Clad Copper Wire
Heavy Duty	5101	1 10	9.99 4,700	10% 5%	5.5	4	350 °C.	BELOW 100°— NEGLIGIBLE ABOVE 100°— 0.01% /°C.	15/32"	13/64"	1¼"	
Heavy Duty	5306	10	15,000	5%	8.5	7	350 °C.	BELOW 200°— NEGLIGIBLE ABOVE 200°— 0.01% /°C.	13/16"	9/32"	1½"	

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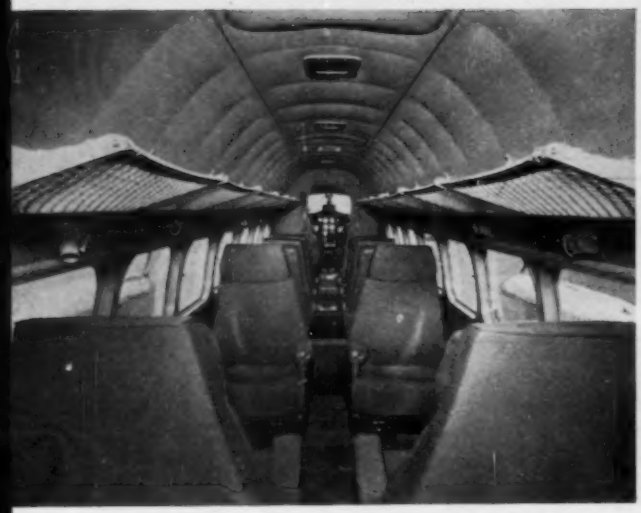


ROYAL HERON: On the left is the interior of the N.Z.N.A.C. Heron in which the Queen and the Duke of Edinburgh were to fly from Rotorua to Gisborne on January 6th. The crew consisted of (left to right) Capt. H. C. Walker, A.F.C., the company's operations manager, Capt. W. Raymond and Stewardess Audrey Winefield. The Royal party will also make several flights in Dakotas of N.Z.N.A.C.

CIVIL AVIATION . . .

BREVITIES

ON January 1st the Republic of China became the 62nd member-nation of I.C.A.O. China joined the organization on its inception in 1947, but withdrew from membership on May 31st, 1951.

* * *

Registration letters G-ANHA-F inclusive have been allocated to B.E.A.'s second batch of Viscount 701s. The initial order for 20 is well on the way to completion; 16 have been delivered.

* * *

El Al Israel Airlines have acquired a fourth Constellation, which will enter service on their routes in about two months' time.

* * *

Taylor Woodrow Construction, Ltd., have been awarded the contract for the superstructure of the "eastern apex" building in the central area at London Airport. The same company recently completed the 2,040ft access tunnel connecting the Bath Road with the terminal area, and holds contracts for the two other terminal buildings—control tower and passenger-handling building. The "apex" will take two years to complete.

Suggested as a suitable vehicle for carrying small groups around airports or large factories, and shortly to be offered on the British market at "less than £1,000," the Volkswagen Microbus employs the same engine as the manufacturer's famous small car but can accommodate a driver and seven passengers. Cruising speed is given as 50 m.p.h. and fuel consumption as 27-30 m.p.g.

* * *

Pan American's traffic and sales manager for the United Kingdom, Mr. James Montgomery, recently returned to the United States to take up his new appointment as passenger sales manager there. He is succeeded by Mr. James O. Leet, who has been the airline's station manager at London Airport since April 1947. PanAm also announces the appointment of Lt. Cdr. Kenneth Leach as U.K. district sales manager; he was previously assistant sales manager.

Mr. J. O. Leet.

CLUB AND GLIDING NEWS

PILOTS of the Rochester Flying Club, which now has a fleet of three Tiger Moths, two Magisters and an Auster, logged 1,600 hr during 1953. A.T.C. pupils were responsible for about half this total. The club is operated by Short Bros. and Harland, Ltd.; in addition to the full-time C.F.I., S/L. F. Holt, A.F.C., it has the part-time services of ten qualified instructors.

Through its parent company, the club has close affiliations with the Navy, as demonstrated at the recent annual dinner, held to celebrate the 50th anniversary of powered flight. Guests included Admiral Sir Albert Poland, K.C.B., D.S.O., C.-in-C. R.N. Dockyard, Chatham, Admiral M. S. Slattery, C.B., managing director of Short Bros., and Cdr. Johnston, D.S.C., representing Rear Admiral Reserve Aircraft. Also present were several members of the Naval Ferry Flight based at Rochester (and likewise operated by Shorts), whose chief pilot is Lt. Cdr. A. E. R. Forwood, O.B.E.

AMONG the other social events arranged to coincide with the powered flight anniversary last month was the Wolverhampton Aero Club's dance, held at the Victoria Hotel, Wolverhampton, and marking the conclusion of a successful year for the club. The year's flying time amounted to 1,782 hr, and 33 private pilots' licences were gained—in each case an increase over the 1952 figures. Under the A.B.A.C. works flying-club scheme, the employees of three local companies are now learning to fly at Wolverhampton.

At the club's "At Home" on September 27th, the H.M. Hobson Cup, Webster Cup and Chairman's Cup were won by M. D. Hill, A. E. Guy and H. Nutt respectively. Dr. L. W. Hamp was awarded the Veteran's Cup and, in the inter-club relay race with the Derby club, Wolverhampton was successful. A thirty-hour lecture course and a link-trainer competition are forming part of the club's winter activities.

A SERIES of three light-aircraft records (subject to confirmation) were recently established in Australia, under the control of the Aero Club Federation of Australia and the Australian Department of Civil Aviation. The flights, made in Auster Autocar VH-ADY (fitted with a 155-h.p. Cirrus Major III engine) were sponsored by the Kingsford Smith Aviation Service in an attempt to demonstrate the reliability and economy of modern light aircraft. Miss Margaret Cornwell was the pilot, and on the second and third flights Mr. E. Wills performed the duties of radio operator/navigator.

The first flight was made on October 31st from Sydney to Adelaide, the 720 miles being covered in 8 hr 12 min non-stop; Miss M. Sincotts was carried as passenger. On November 14th, the 930-mile out-and-return flight between Sydney and Brisbane was flown in 8 hr 15 min at an average speed of 112.7 m.p.h. Finally, on December 12th, VH-ADY covered the 1,160 miles from Sydney-Broken Hill-Sydney in exactly 10 hr.

In the rear of the cockpit of the Auster was installed a 49-gallon long-range fuel tank, together with an extra two-gallon oil tank. Fuel consumption on the three flights averaged six, seven and 6.5 gallons per hour respectively; oil consumption amounted to approximately one pint per hour. Radio equipment comprised a remotely controlled Plessey TR61 V.H.F. set.

DETAILS of an interesting series of German "pod-and-boom"-type sailplanes are available from the British distributors, the Atlas Manufacturing and Distributing Company, of 85, York Street, London, W.1. (Ambassador 5582). The machines are the Greif models 1, 3 and 5, all designed by Hans Hollfelder, and developed from the 14.8-metre Greif 4 (formerly known as the EW 18). These machines are of mixed wood and metal construction, and duralumin is used both in the pod-type hull and (exclusively) for the thin tail boom.

COOLING OF ROCKET MOTORS

Problems of Extreme Heat-flow Rates Discussed in an Interplanetary Society Lecture

CURRENT techniques of protecting and cooling rocket-motor walls was the subject of a paper given recently before the British Interplanetary Society. The lecturer was Mr. H. Ziebland, a Government scientist engaged on rocket research; he was the designer responsible for the 100-ton-thrust rocket motor intended for the proposed German round-the-world bomber.

Mr. Ziebland said that the liquid-propellant rocket motor set the designer a large number of new problems, not the least of which was that of discovering reliable techniques for protecting the inner walls of the combustion chamber and nozzle. The magnitude of this task could be deduced from the fact that the heat-flow density through the chamber wall could reach 3 B.Th.U./sq in/sec and 12 B.Th.U./sq in/sec through the throat of the expansion nozzle. These figures were equivalent to 5 h.p./sq in and 20 h.p./sq in respectively! For comparison, the peak value in an internal combustion engine was about 0.07 B.Th.U./sq in/sec.

Four basic methods existed for protecting the motor walls: thermal capacity; refractory materials; external cooling; and film cooling. In the first of these the entire combustion chamber and nozzle were of metal construction with thick walls; the heat from the combustion gases was transmitted to and retained by the metal walls. The limitation of this method for high-temperature exhaust gases was the melting of the metal. This depended not only on the melting point of the metal but also on the thermal capacity and thermal conductivity, both of which should be high. For example, in a nozzle with a heat-transfer rate of 10 B.Th.U./sq in/sec and a gas temperature of 3,000 deg C a duralumin construction would reach its melting point (680 deg C) on the surface in 0.7 sec, mild steel (1,400 deg C) in 1.9 sec and copper (1,085 deg C) in 6.5 sec. Copper was, in fact, sometimes used for experimental chambers and nozzles but the weight involved made this technique unsuitable for flight units even if the short running times were acceptable. It was of interest to note that by the time the inner wall of the mild-steel nozzle had reached its melting point the temperature at a distance of 2 cm from the surface of the metal had hardly risen above its initial value.

The use of refractory materials was the next logical step. If a material with an even lower thermal conductivity than mild steel were used, then the surface temperature would rapidly approach the gas temperature whilst the material only a short distance from the surface would remain quite cool. The only materials with high enough melting points were the high refractories. In view of their poor mechanical strength they could not be used by themselves, but needed a metal casing. In addition such materials were very liable to fail under thermal shock, that is, they cracked badly when subjected to the rapid rise in temperature associated with starting a rocket motor. However, the melting points of some of these materials were very high, in some cases nearly 4,000 deg C, and graphite, tungsten carbide and silicon carbide had already been satisfactorily used. By choosing the right type of refractory it should be possible to increase considerably the running times of uncooled high-performance motors, in some instances up to 60 secs.

External cooling was one of the most widely used techniques. A cooling fluid was circulated through channels of small cross-section on the outside of the wall exposed to the combustion gases. For experimental work water was frequently used, because of its good thermal properties, but in a flight motor one or both of the propellants were employed, since the extra weight of an additional fluid would prohibit its use. Because of the high heat-flow densities the thermal resistance of the wall was very important and thus it might not be possible to use certain materials although such materials might appear advantageous from, say, a manufacturing point of view. Thus, with a wall thickness of 2.5 mm and a temperature of 200 deg C on the cooled side, a wall of 18-8 chrome-nickel steel would reach its melting point at just over 6 B.Th.U./sq in/sec and mild steel at 8.5, whereas both copper and pure aluminium would be well below their melting points at 10. From the heat-transfer point of view thin walls were thus desirable, although this was in conflict with the strength requirement. Since the coolant was circulated round the jacket prior to injection it was clear that, on starting, the actual pressure-differential across the wall could be high. Since the buckling strength of a chamber of a given thickness varied inversely as the cube of its diameter the design of large chambers could become difficult.

It was often the case that external cooling was insufficient by itself, and then film cooling was used as additional protection. In this technique part of the coolant was injected through holes in the chamber wall and formed a film on the inner surface. Thus some of the heat was absorbed by the cooling fluid before it could reach the wall. Liquid coolants were more suitable than gases because of their higher thermal capacity and also because they were opaque to infra-red radiation. The positioning of the coolant injection holes was a difficult problem and could only be determined experimentally; generally speaking, the smaller the holes and the more evenly they were distributed over the cooled surface the better were the results. A development of this method, "transpiration cooling," utilized a porous material for the chamber wall through which the coolant was forced, to form a continuous film on the surface. Great difficulties had, however, been encountered in producing materials of constant and controllable porosity and the method had not so far had any practical applications.

The lecturer concluded by saying that the determination of cooling requirements for rocket motors was still largely a matter of experiment. This was partly due to our lack of fundamental knowledge of heat-transfer phenomena, but to a greater extent to the secondary influences, such as the effect of injector design and chamber configuration, which were very difficult to assess.

PEST CONTROL IN CEYLON

FOLLOWING recent trials, aerial spraying operations against oidium blight on the rubber trees of Ceylon are due to begin tomorrow, January 9th. Pest Control, Ltd., of Cambridge, are operating two of their Hiller 360s and one Auster, which will be flown by Mr. Richard Hill, Mr. George Toye and Mr. H. E. Johnson respectively.

Dr. W. E. Ripper, the entomologist who founded Pest Control, Ltd., first investigated the menace of the oidium fungus on a visit to Ceylon early in 1953, and a preliminary operational survey was made by Mr. James Harper, A.F.C., the company's aviation manager, in October.

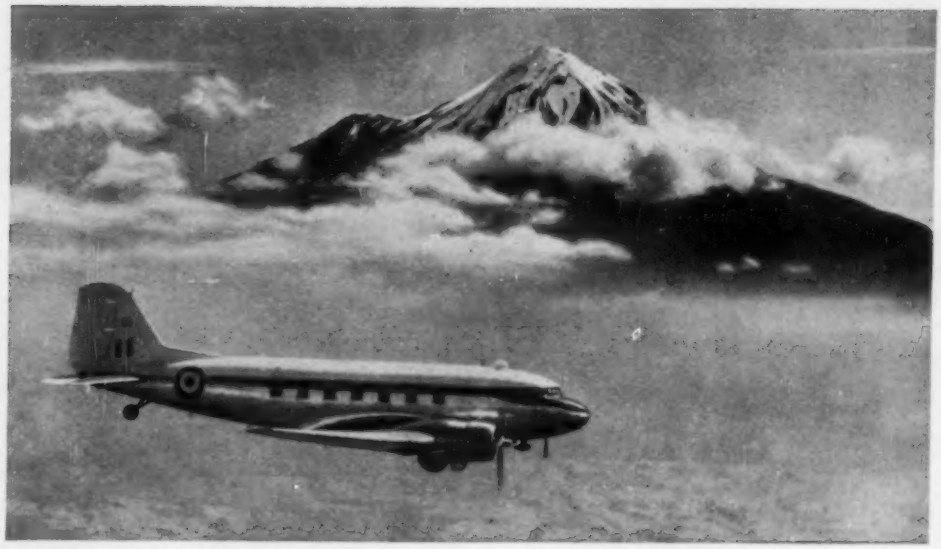
It is known that the fungus can be controlled with sulphur preparations. It attacks the leaves of rubber, and the spray must cover the twigs and leaves for a period of two to three months for full effectiveness, so that the leaves are protected as they appear at different times on different parts of the tree.

It seems that only spraying from the air can give the rubber trees the complete coverage that is necessary. Dusting and wet-spraying form part of the normal routine on the estates, but the trees grow to heights of 60-80ft on the average (and sometimes over 100ft), and it is impossible to give them overall protection by these normal ground methods.

SCHOOLBOYS' SEVENTH HEAVEN

AMONG the varied exhibits at the Schoolboys' Own Exhibition, now in its second and final week at the Horticultural Halls, Westminster, are a number with an aeronautical flavour. On the Shell-Mex and B.P. stand, for example, there is a complete Link trainer in which boys may sample the feel of an aircraft's controls. The hood has been removed and the trainer is flown only "V.F.R." On the R.A.F. stand there is a complete Canberra nose section mock-up of the type used in the Service for practising cockpit drills.

An ingenious test of skill has been arranged on the stand of J. Lyons and Co., Ltd. A series of electrically-driven model helicopters balanced on freely rotating arms have been set up on a number of circular tables. A group of boys race to complete a series of manœuvres on instructions passed on loudspeakers to each competitor. The central control has been set up in the nose-section of a Horsa glider, which, with all the normal controls still in place, has been adapted for this purpose. The helicopters, though confined to a circular flight-path, can be flown forwards or backwards; three-speed control of the rotors allows hovering, climbing and descending. They are surprisingly realistic to handle, since the control response is very similar to that of a full-sized aircraft; some practice is required to fly them accurately.



ANTIPODEAN BEAUTY: The Royal New Zealand Air Force Dakota reserved for the use of the Queen and the Duke of Edinburgh during their stay in New Zealand passes the snow-capped summit of Mount Egmont in North Island.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

New Year Honours

BRIEFLY referred to in our last week's issue, the New Year's Honours list includes a large number of Royal Air Force officers, airmen and airwomen.

Air Chief Marshal Sir John W. Baker becomes a Knight Grand Cross in the Order of the British Empire and Air Marshals C. E. N. Guest and H. T. Lydford become Knights Commanders in the same Order. Air Marshal Guest is A.O.C-in-C. Transport Command and Air Marshal Lydford A.O.C-in-C. Home Command.

In the Order of the Bath, Air Marshal G. H. Mills, A.O.C-in-C. Bomber Command, and Air Marshal C. B. R. Pelly, C-in-C. Middle East Air Force, are both appointed Knights Commanders. A. Cdre. F. R. D. Swain—one-time holder of the world's height record—becomes a Companion in the same Order.

Two R.Aux.A.F. recipients of the Air Force Cross are Act. S/L. D. de Villiers, the commanding officer of No. 500 (County of Kent) Squadron, and chief test pilot to de Havilland Propellers, Ltd., and Act. S/L. J. McR. Cormack, the recently appointed commanding officer of No. 600 (City of London) Squadron.

ORDER OF THE BATH

Knights Commanders.—Air Marshal G. H. Mills, C.B., D.F.C.; Air Marshal C. B. R. Pelly, C.B., C.B.E., M.C.

Companions.—A.V-M. V. S. Ewing, C.B.E., M.B., Ch.B., D.P.H.; A.V-M. J. H. Edwardes-Jones, C.B.E., D.F.C., A.F.C., B.A.; Act. A.V-M. B. V. Reynolds, C.B.E.; A. Cdre. L. W. C. Bower, D.S.O., D.F.C.; A. Cdre. H. L. Messiter; A. Cdre. F. R. D. Swain, C.B.E., A.F.C.; A. Cdre. G. N. E. Tindal-Carill-Worsley, C.B.E.; Act. A. Cdre. H. F. G. Southey.

ORDER OF THE BRITISH EMPIRE

Knight Grand Cross.—Air Chief Marshal Sir John Wakeling Baker, K.C.B., M.C., D.F.C., A.D.C.

Knights Commanders.—Air Marshal C. E. N. Guest, C.B., C.B.E.; Air Marshal H. T. Lydford, C.B., C.B.E., A.F.C.

Commanders.—A. Cdre. H. Ford, A.F.C., B.A.; A. Cdre. D. N. Roberts, O.B.E., A.F.C.; A. Cdre. C. A. Rumball, O.B.E., M.R.C.S., F.R.C.P., D.T.M. and H., D.P.M., L.D.S., Q.H.P.; A. Cdre. J. N. T. Stephenson; G/C. W. F. Beckwith, O.B.E., B.Sc.; G/C. C. Crowley, M.B., B.Ch., D.P.H., D.I.H.; G/C. K. W. Godfrey, R.A.F. Regt.; G/C. E. C. Kidd, O.B.E., A.F.C., A.F.M.; G/C. L. P. Moore.

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AWARDS

Bar to Air Force Cross.—Wing Commanders E. W. Anderson, O.B.E., D.F.C., A.F.C.; H. H. S. Brown, A.F.C., M.B., B.S. Squadron Leaders F. S. Hazlewood, A.F.C.; C. S. Hunton, D.F.C., A.F.C.; T. Stevenson, A.F.C.; Act. Squadron Leader H. T. Murley, D.F.C., A.F.C.; Flight Lieutenant R. L. E. Burton, A.F.C.

Air Force Cross.—Group Captain D. A. Wilson, M.R.C.S., L.R.C.P., D.M.R.E., D.M.R. Wing Commanders T. Balmforth, D.S.O., D.F.C.; R. N. H. Courtney, D.F.C.; J. B. Coward; F. D. Hughes, D.S.O., D.F.C.;

K.C.B.—Air Marshal G. H. Mills, C.B., D.F.C.

K.C.B.—Air Marshal C. B. R. Pelly, C.B., C.B.E., M.C.

G.B.E.—Air Chief Marshal Sir John W. Baker, K.C.B., M.C., D.F.C., A.D.C.

K.B.E.—Air Marshal C. E. N. Guest, C.B., C.B.E.

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Royal Red Cross (First Class).—Wing Officer A. Lowrey, A.R.R.C., P.M.R.A.F.N.S.; Squadron Officer E. Maltman, A.R.R.C., P.M.R.A.F.N.S.

Air Force Medal.—Master Signaller J. J. Coucher. Flight Sergeants R. J. Brydon; F. W. Burney; R. E. A. Buttle; T. E. Evans; W. R. Farrer; R. Lockhart, D.F.M.; J. A. D. Meechan, D.F.C.; D. F. J. Smith; E. Walker; J. E. Williamson. Sergeants W. A. Barrell; G. G. Davey; A. Nisbet; J. Schellong; R. T. D. Smith.

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There are also 71 Queen's Commendations for Valuable Service in the Air.

The Malta Memorial

TO be unveiled by the Queen on May 3rd next, the Malta Memorial is now being constructed by the Imperial War Graves Commission. It is to commemorate the 2,300 officers and men of the air forces of the Commonwealth operating from bases in the central Mediterranean area who lost their lives and have no known grave.

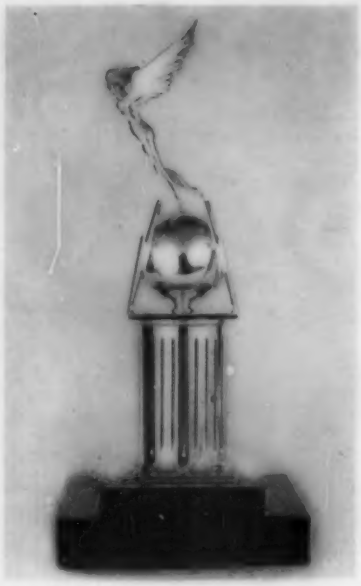
The Memorial takes the form of a gilded bronze eagle 7ft 9in high, surmounting a 39ft column. Sir Herbert Worthington is the architect; the eagle, which was shown in the summer exhibition of the Royal Academy last year, is the work of Mr. Charles Wheeler.

Next-of-kin of all who are commemorated on the memorial will receive invitations to attend the unveiling ceremony and particulars of a pilgrimage to Malta which the R.A.F.A. hope to organize.

These invitations are being posted at once and next-of-kin are requested to await the letters before communicating with the Commission.

Ariel Trophy

THE first winner of the Ariel Trophy is the Northern Air Division of the R.N.V.R., which has its headquarters at R.N. Air Station, Stretton, Lancashire.



NAVAL PRIZE: The trophy made by the R.N. Air Electrical School at Worthy Down (see "Ariel Trophy," on this page).

The presentation will be made on January 31st by Vice-Admiral A. K. Scott-Moncrieff, C.B., C.B.E.

The trophy—illustrated on this page—was made by ratings of H.M.S. *Ariel*, the R.N. Air Electrical School at Worthy Down. It is to be awarded annually to the R.N.V.R. Air Division having the best attendance record of electrical officers and ratings.

No. 615 Sqn. Handed Over

AT a small ceremony at Biggin Hill on January 2nd, S/L. F. B. Sowrey, A.F.C., handed over the command of No. 615 (County of Surrey) Squadron, R.Aux.A.F., to S/L. R. A. Eeles, who has been a member of the unit for some time past.

In an earlier reference to this change in command, S/L. Eeles was mentioned as being a son of A. Cdre. H. Eeles; he is, of course, the air commodore's cousin.

Half-yearly Promotions

IN the recently issued half-yearly list of promotions the Air Ministry announces the creation of four air marshals and five air vice-marshals. Of the latter, four are in the General Duties Branch and one in the Technical Branch.

Air Vice-Marshal to Air Marshal.—G. H. Mills, C.B., D.F.C., A.O.C-in-C. Bomber Command; Sir Harry Broadhurst, K.B.E., C.B., D.S.O., D.F.C., A.F.C., C-in-C. 2nd T.A.F.; C. B. R. Pelly, C.B., C.B.E., M.C., C-in-C. M.E.A.F.; Sir Dermot A. Boyle, K.C.V.O., K.B.E., C.B., A.F.C., A.O.C-in-C. Fighter Command.

Air Commodore to Air Vice-Marshal.—W. G. Cheshire, C.B.E., A.O.A. 2nd T.A.F.; J. G. Elton, C.B.E., D.F.C., A.F.C., A.O.A. Bomber Command; C. E. Chilton, C.B., C.B.E., Assistant C.A.S. (Policy); G. I. L. Saye, C.B., O.B.E., A.F.C., A.O.A. M.E.A.F. (from February); J. G. Franks, C.B.E., A.O.C. No. 24 (Training Group).

Group Captain to Air Commodore.—(General Duties Branch) C. C. McMullen, C.B.E., A.F.C.; H. R. Graham, D.S.O., D.F.C.; A. A. Adams, D.F.C.; J. D. Miller, C.B.E.; J. F. Hobler, C.B.E.; C. G. Lott, C.B.E., D.S.O., D.F.C.; G. J. C. Paul, D.F.C. (Other Branches) J. R. Mutch, C.B.; W. A. Stagg, C.B.E.; R. W. L. Glenn; F. J. A. Tanner, A.D.C.; J. Hill, M.B., Ch.B., D.P.H.

THE LAST JUMP: (Top) Pilots of No. 147 Squadron, who flew the last of the "Becher's Brook" convoys of Canadair-built Sabres: they are seen at Kinloss on arrival on December 19th. In the centre is S/L. T. Stevenson, A.F.C., the O.C.; other pilots are: F/L.s D. E. Burton and J. L. W. Dunn, F/O.s J. S. Hind and I. Jones, P/O. J. Butryn, F/Sgts. J. A. D. Meechan, J. Howard, L. W. Greene and P. Crews, and Sgt. G. T. Lovett. The lower picture shows the Sabres refuelling at Kinloss (with Lockheed Neptunes behind) before flying down to Lyneham. The Sabres are of the Mk 5 type, which has no slats but, instead, extended leading-edges carrying small fences.

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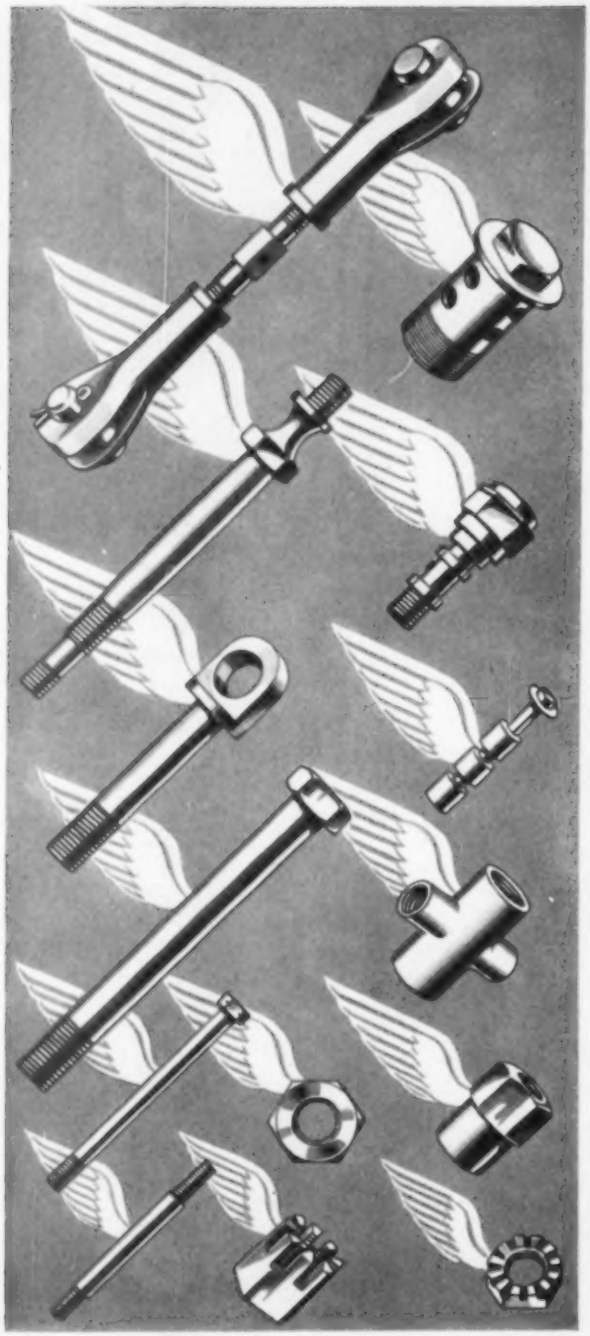

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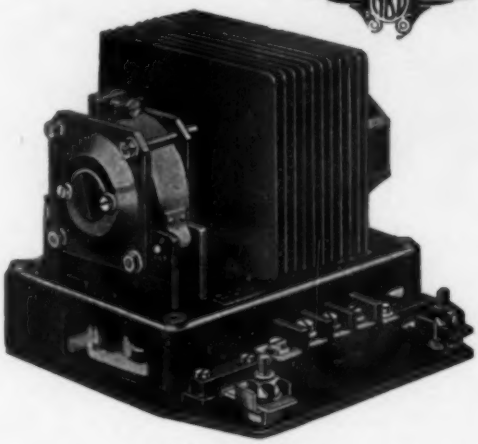

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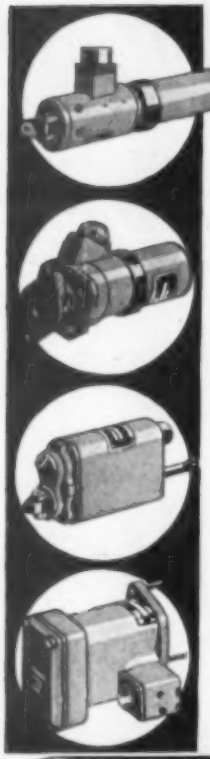

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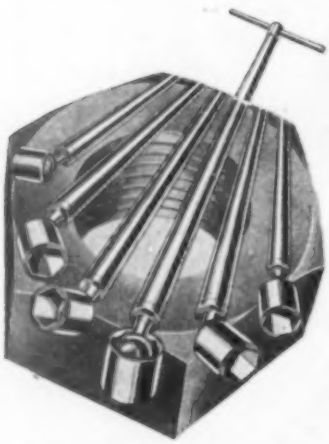

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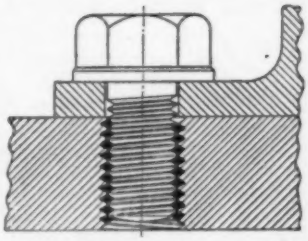

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ENGLAND. On December 25th, 1953, suddenly, at 73 O.M.Q., Altwood Road, Maidenhead. Estelle, loved wife of W/C. H. A. England, D.F.C., R.A.F., and Mummy of the twins and Nigel. [1477

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PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

Application No. 43/1 from Airwork Ltd., of 15 Chesterfield Street, London, W.1, for an amendment to the colonial coach service which they are at present approved by the Minister of Transport and Civil Aviation to operate between London (Blackbushe) and N'dola, Lusaka and Salisbury (S. Rhodesia) via Malta, to permit an increase in frequency to one return service per fortnight.

Application No. 18/1 from Hunting Air Transport Ltd., of 5 Fitzhardinge Street, London, W.1, for an amendment to the colonial coach service which they are at present approved by the Minister of Transport and Civil Aviation to operate between London (Bovingdon) and N'dola, Lusaka and Salisbury (S. Rhodesia) via Malta, to permit an increase in frequency to one return service per fortnight.

FROM Airwork Ltd., of 15 Chesterfield Street, London, W.1:—

Application No. 244 for a colonial coach service with Viking aircraft for the carriage of passengers and supplementary freight between London (Blackbushe) and Malta, operated jointly with Hunting-Clan Air Transport Ltd. at a combined frequency of from two to seven services weekly, during a seven-year period from March 1st, 1954.

Application No. 245 for a coach service with Hermes and/or Viking aircraft for the carriage of passengers and supplementary freight between London Airport and Bahrein with an intermediate traffic stop at Malta, at a frequency of from one service per fortnight increasing with traffic demand, during a 10-year period from March 1st, 1954.

Application No. 246 for a colonial coach service with Hermes aircraft for the carriage of passengers and supplementary freight between London Airport and Singapore with intermediate traffic stops at Malta and Bahrein, at a frequency of from one service per fortnight increasing with traffic demand, during a 10-year period from March 1st, 1954.

Application No. 247 for a colonial coach service with Hermes aircraft for the carriage of passengers and supplementary freight between London Airport and Hong Kong with intermediate traffic stops at Malta and Bahrein, at a frequency of from one service per fortnight increasing with traffic demand, during a ten-year period from March 1st, 1954.

Airwork Ltd. ask for permission to integrate at their discretion the services requested in Applications Nos. 245, 246 and 247, especially in the initial stages of operation.

Application No. 248 from British Overseas Airways Corporation of Airways House, Great West Road, Brentford, Middlesex, for permission to make for the maximum period a traffic stop at Salisbury (Kentucky Farm) alternative to that at Livingstone on their normal scheduled service between London and Johannesburg on the route set out as Route 12 in Schedule "A," Part I, of the terms of reference issued to the Air Transport Advisory Council by the Minister of Civil Aviation on July 30th, 1952.

Application No. 249 from British Overseas Airways Corporation of Airways House, Great West Road, Brentford, Middlesex, for permission to extend for the maximum period to Chicago the normal scheduled services which they operate between London and Montreal on the routes set out as Routes Nos. 16 and 18 in Schedule "A," Part I of the terms of reference, issued to the Air Transport Advisory Council by the Minister of Civil Aviation on July 30th, 1952.

THESE applications will be considered by the Council under the terms of reference issued to them by the Minister of Civil Aviation on July 30th, 1952. Any representations or objections with regard to these applications must be made in writing, stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9 Buckingham Gate, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [1483

PATENTS

THE proprietor of British Patents Nos. 605642 for "Improvements in Control Means for Aircraft," 609229 and 628047 both for "Improvements in or Relating to Aircraft," 613051 for "Improvements to Retractable Landing Gears for Aircraft," 614230 for "Improvements to Aeroplanes, with a View to Improving their Habitability at High Altitude," and 631247 for "Improvements in Devices for Launching Rockets from Aircraft," desires to enter into negotiations with a firm or firms for the sale of the patents or for the grant of licences thereunder.—Further particulars may be obtained from Marks and Clerk, 57 and 58 Lincoln's Inn Fields, London W.C.2. [1455

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SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

THE COLLEGE OF AERONAUTICS

RESEARCH ASSISTANT required in DEPARTMENT OF AERODYNAMICS. The person appointed will be required to assist in research on problems arising from the generation of noise by aircraft. He will, however, be given every encouragement to take full advantage of the educational facilities of the College. Salary within range £450 to £600 per annum depending on qualifications and experience.—Applications, giving full particulars and containing the names and addresses of not more than three referees, to the Recorder, The College of Aeronautics, Cranfield, Bletchley, Bucks, not later than January 29th, 1954. [1463

ASSISTANT METEOROLOGIST required by the MAURITIUS GOVERNMENT for tour of 3 years in first instance. Commencing salary, etc., according to experience in scale equivalent to £614 rising to £866 a year. Outfit allowance up to £30. Free passages. Liberal leave on full salary. Candidates must possess Higher School Certificate or equivalent in Mathematics and Physics, and should have had forecasting experience. —Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name, in block letters, full qualifications and experience, and quote M3B/33530/FE. [1453

AN aircraft firm in the North-West have the following vacancies in their engineering research department.

(a) Two technicians are required to operate a high-altitude chamber and carry out tests on aircraft components.

(b) A number of technicians are required for work in connection with the testing of hydraulic systems, power-operated controls and airframe structures.

CANDIDATES for these vacancies should be of Higher National Certificate or degree standard, and preference will be given to those who have had experience in one of the above fields or on similar work in the aircraft industry.

THE work is of an interesting nature on advanced designs, salaries offered being attractive and commensurate with age and experience.

APPLICATIONS stating full details, including salary required, should be addressed to Box 2381. [1422

A. V. ROE AND CO., Ltd., have the following vacancies in their newly-formed electronics laboratory:

(a) Technicians are required who possess a degree in physics or electrical engineering for work on the development of electronic computing equipment for use in the design office. The electronics department is expanding and is likely to take in many diverse fields of development. Preference will be given to applicants who have had some practical experience.

(b) Technicians are also required who possess an honours mathematics degree for work in connection with programming digital computors which will involve the breaking down of differential equations of the type met with in aircraft structural analysis into forms suitable for arithmetical analysis.

APPLICATIONS stating full details of age, qualifications and experience should be addressed to the Labour Manager, A. V. Roe and Co., Ltd., Greengate, Middleton, Manchester. [1464

BRITISH OVERSEAS AIRWAYS CORPORATION have a vacancy for a navigation instructor at their Central Training Unit, Meadowbank, near London Airport.

Duties:

Lecturing to pilots and station officers and preparing notes on navigational subjects.

Essential qualifications:

(a) To have passed technical examination for Flight Navigator's Licence, or have sufficient knowledge to pass examination within reasonable period;

(b) Previous experience of lecturing;

(c) Ability to express clearly on navigational subjects;

(d) Some practical air navigational experience, not necessarily recent.

Salary: £695 to £875 p.a. Applications should be addressed to Staff Supt. (Recruitment), London Airport, B.O.A.C., Hounslow, Middx. [1468

DESIGN draughtsmen required by R.F.D. Co., Ltd., Godalming. Must be experienced in mechanical engineering or rubberised fabric technology. Practical experience and technical qualifications essential. [1444

A. AND C. licence engineer required by Portsmouth Aero Club. Club experience preferred. Good salary to suitable applicant.—Apply by letter to Portsmouth Aero Club, City Airport, Portsmouth. [1471

SENIOR test engineers required for development work on aircraft hydraulics and undercarriages. Degree or Higher National Certificate essential, experience on similar work desirable.—Applications should be made to: E. G. Collinson, Chief Designer, British Messier, Ltd., Cheltenham Road, Gloucester. [1481

SITUATIONS VACANT

G.E.C. Stanmore Laboratories invite applications for the following vacancies for work on guided missile research. Good canteen facilities, sick fund and pension scheme. Holidays above average.

(i) Senior graduate required to work on the planning and assessment of complex trials on airborne radar. Previous experience in radar work highly desirable. (Ref. F/LMKB.1).

(ii) Graduate, aged about 30, with good degree or equivalent qualifications required for responsible work on technical flight trials of airborne radar. Previous experience of similar work and of flying is very desirable. There is also a junior post vacant for a man with similar qualifications. Both these posts, together with (i) above involve some travelling within the United Kingdom. (Ref. F/LMKB.2).

APPLICATIONS should be made in writing to the Staff Manager, G.E.C. Stanmore Laboratories, The Grove, Stanmore Common, Stanmore, Middx., stating age, qualifications and experience and quoting the appropriate reference. [1473

DESIGN Draughtsman with experience of high grade mechanical work required to act as Checker in Gas Turbine Dept. of East Midlands firm. Gas turbines in full production. Pensionable.—Box 2559. [1460

SENIOR and intermediate design draughtsmen with good experience of aircraft or light structural or mechanical engineering, required for aircraft and armament project work.—Apply, by letter, to Portsmouth Aviation, Ltd., The Airport, Portsmouth. [0612

LICENCED engineers covering Prince and Dakota aircraft. Positions call for up to six months overseas service per year when advantageous rates of allowances are paid.—Apply: Hunting Aerosurveys, Limited, 6 Elstree-way, Boreham Wood, Herts. [1482

A DESIGNER/DRAUGHTSMAN is required to carry out a programme of development on Mechanical and Electrical Instrument Equipment.—Write full details of qualifications and experience to Bryans Aeroquipment Ltd., Willow Lane, Mitcham Junction. [1458

LICENSED radio engineer and radio mechanics at our base at Stansted Airport, Essex.—Apply by letter or telephone to the Senior Radio Engineer, Aviation Traders, Ltd., Southend Airport, Essex. Tel.: Rochford 56491. [0950

A. V. ROE AND CO., Ltd., have vacancies for aerodynamicists and senior aerodynamicists in their Chadderton design office. Candidates should have some previous experience of aerodynamics on either performance, stability and control, wind tunnel or flight test work.

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PLEASE send particulars of age, experience and salary required to the Chief Designer, A. V. Roe and Co., Ltd., Greengate, Middleton, Manchester. [1421

AIRCRAFT or mechanical draughtsmen, all graded and junior aircraft stress and weightsmen required. —Apply, stating age, experience and salary required, to the Chief Draughtsman, Alan Muntz and Co., Ltd., Aircraft Division, Langley Aerodrome, Slough, Bucks. [0368

SERVICE engineers required for electro-pneumatic and electronic aircraft equipment. Must be prepared to be away for at least five working days at a time. —Apply, stating experience and salary, to Service Manager, Teddington Controls, Ltd., Cefn Coed, Merthyr Tydfil, South Wales. [1467

ARMSTRONG SIDDELEY MOTORS have vacancies for a technical writer and a technical artist in the Technical Publications Section of their Aero Sales Department. The work is interesting and applications are invited to Reference DL.1, Personnel Manager, Armstrong Siddeley Motors, Coventry. [1440

H. M. HOBSON, Ltd., invite applications for positions in the drawing office as follows: designers, detail and modification draughtsmen, checkers, stressmen. The work is concerned with interesting projects connected with fuel metering equipment and hydraulic flying controls for aircraft.—Hobson Works, Fordhouses, Wolverhampton. [0420

EXPERIENCED Technical Illustrator, Authors and Spares schedule compilers required for the preparation of aircraft maintenance manuals, etc. Good wages and permanent posts for suitable men.—Applications in writing should state age, experience and wage expected, and be addressed to the Chief Designer, Auster Aircraft Ltd., Rearsby Aerodrome, Leicester. [1456

SERVICE engineers required for installation, flight testing and servicing of aircraft navigational and auto-pilot equipment. Applicants must be prepared to travel. Essential to have sound knowledge of radio and electronic principles and practice, preferably to C. and G. Radio III standard. Good conditions, pension scheme.

APPLY with full details and salary required, quoting No. 1439, to Personnel Manager, Sperry Gyroscope Co., Ltd., Great West Road, Brentford, Middx. [1429

REQUIRED immediately by Percival Aircraft, Ltd., Luton Airport, Beds, several draughtsmen with comprehensive experience of engine installation and allied systems. Good welfare facilities, including staff pension scheme.—Applications in writing, stating age, qualifications, experience and salary required to the Personnel Manager. [0601

SENIOR test engineers required for development work on sensitive hydraulic servo mechanisms for guided weapons. Degree or High National Certificate essential. experience on similar work desirable.—Applications should be made to: G. Orloff, Deputy Chief Engineer, British Messier, Ltd., Cheltenham Road, Gloucester. [1480

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Personnel Manager, Sperry Gyroscope Co. Ltd., Great West Road, Brentford, Middx.

SITUATIONS VACANT

MECHANICAL Test Engineer for development work on metal-to-metal adhesives. This is an interesting opportunity for a young man to join vigorous and expanding firm. Superannuation scheme.—Please address full details of career and salary expected to the Managing Director, Aero Research, Ltd., Duxford, Cambridge. [1459

TEST laboratory assistants (male) required by Percival Aircraft, Ltd., Luton Airport, Beds. National Certificate standard and previous experience on design of test laboratory equipment desirable. Good welfare facilities including staff pension scheme.—Applications, stating qualifications, experience, age and salary required to Personnel Manager. [0596

SENIOR structural and mechanical test engineer required, to supervise an interesting programme of test work on fixed and rotating wing aircraft. Good welfare facilities including staff pension scheme.—Applications in writing to Personnel Manager, Percival Aircraft, Ltd., The Airport, Luton, Beds, stating age, experience and salary required. [0594

COST accountant required by large aero engine manufacturers in West of England. Must have wide engineering experience, preferably on aero engine work. Knowledge of mechanised accounting essential. Good salary paid to suitable applicant. House available.—Write, with full details of age, experience and salary required, to Personnel Manager, Box 1NB. 4693. A.K. Advg., 212a Shaftesbury Ave., London, W.C.2. [1479

DRAUGHTSMEN, Senior and Intermediate, required in connection with the design and fabrication of light alloy and stainless steel aircraft components. Applicants should have Ordinary National or equivalent. Aircraft experience an advantage.—Write, giving details of age, experience and qualifications, to Chief Draughtsman, Delaney Gallay, Ltd., Edgware Road, Cricklewood, N.W.2. [1454

AIR FORCE, Naval, civil and helicopter aircraft all under design and development at Percival Aircraft, Ltd., Luton Airport, Beds. Applications are invited from senior and junior draughtsmen and stressmen for work on this interesting programme. Good welfare facilities, including staff pension scheme.—Write, giving details of experience and salary required, to Personnel Manager. [0595

THE ENGLISH ELECTRIC Co., Ltd., have vacancies for technical assistants of H.N.C. standard to take charge of development structural tests as part of a comprehensive programme of testing on guided weapons. Previous experience of structural development or aircraft stressing an advantage.—Applications to Dept. C.P.S., 336/7 Strand, W.C.2, quoting ref. 1147E. [1472

ALUMINIUM ALLOY AIRCRAFT SPECIALIST. Manufacturers of wrought aluminium alloys require metallurgically trained aircraft engineer for liaison, technical service and development with the Aircraft Industry. Thorough knowledge of A.I.D. inspection and testing procedure necessary. Will operate from Head Office in London.—Applicants, preferably not over 35 with 5 to 10 years' experience in Aircraft Industry. Permanent. Pension Scheme.—Box 2560. [1461

ARMSTRONG SIDDELEY MOTORS, Coventry, have vacancies for a number of designers and senior and junior draughtsmen. Although gas turbine experience in most advantageous it is not necessarily essential as training will be given in this specialized work to suitably qualified draughtsmen.—Apply in detail to Reference F.103, Personnel Manager, Armstrong Siddeley Motors, Coventry. [0200

FERRANTI, Ltd., Edinburgh, have a vacancy for a senior stress engineer for work in connection with the installation of experimental equipment in aircraft. Applicants should be fully qualified and must have experience in aircraft stress office work. Interesting work offering good prospects. Staff pension scheme.—Apply, giving full details of qualifications, training and experience, and quoting Ref. SE/DDO to the Personnel Officer, Ferranti, Ltd., Crewe Toll, Edinburgh 5. [1446

HANDLEY PAGE (READING), Ltd., The Aerodrome, Woodley, Reading, have an immediate vacancy for a senior aircraft electrical draughtsman for work on an interesting new project. Only those who are fully experienced in all aspects of the work should apply, and for the successful applicant there will be suitable housing accommodation provided.—Please send full particulars of experience, etc., to the Personnel Officer. [0235

AERODYNAMICISTS and aeronautical engineers required by Ministry of Supply Research and Development Establishments mainly in the south of England. Fields of work include: Investigations on performance stability, and control and operation techniques for aircraft, including helicopters; flight problems of torpedoes and mines in air and water (necessitating participation in trials which may involve flying or going to sea); research on aerodynamics of unsteady motion, particularly problems of aircraft flutter prediction; aircraft structural research where experience of stressing and design work may be of advantage; aerodynamic problems of flight at supersonic speeds. Appointments according to qualifications and experience as: scientific officer (1st or 2nd class honours degree or equivalent in aeronautical engineering, mathematics, etc.), £417 to £781; assistant experimental officer (Higher School Cert. (science) or equivalent—higher qualifications and relevant experience may be an advantage), £264 (age 18) to £576; experimental officer (H.S.C., etc., but min. age 26), £649 to £799. Women somewhat less. Appointments unestablished. F.S.S.U. benefits may be available for S.O.s. Application forms from M.L.N.S., Technical and Scientific Register (K), 26 King Street, London, S.W.1, quoting C 672/53A. [1469

SITUATIONS VACANT

GRAVINER COLNBROOK have a number of staff vacancies in connection with an interesting programme of work on their internationally known airborne fire protection equipment and other projects of a similar nature. Vacancies are for basic research and development work on fire extinguishers, fire overheat detectors, crash operated devices and other small aircraft components of similar nature, and for work on production problems on these items.

VACANCIES exist for: development engineers and physicists with honours degree in mechanical engineering or electrical engineering or physics, and several years experience in development or research. Age preferably 25-35. Ref. RG 541. Technical assistants with minimum qualification of pass degree or H.N.C. (for development work). Ref. RG 452. Technical assistants with minimum qualification of H.N.C. (for production problems). Ref. RWS 543. A staff pension scheme is in operation and the company has its own sports field and canteens.—Apply, in writing, to Personnel Manager, Graviner Colnbrook, Poyle Mill Works, Colnbrook, Bucks, quoting the references shown. [1474

A MATERIALS ENGINEER is required to guide the employment and manufacturing processes connected with the use of rubber, plastics and other new materials in aircraft ancillary equipment. It is essential for candidates to be well qualified and have an intimate knowledge of up-to-date methods of using rubber. This is a new appointment of considerable importance and the remuneration will be in keeping with the qualifications and experience of the successful candidate.—Write Box F.129, c/o 191, Gresham House, E.C.2. [1452

THE ENGLISH ELECTRIC Co., Ltd., Luton, have vacancies for senior technicians and mechanical designers to work on rocket motor projects. These posts offer the opportunity of working on advanced designs and obtaining a key position in an expanding industry. Qualifications: an engineering degree or equivalent for technicians and H.N.C. for designers. Previous experience on rocket motors or aircraft powerplants is an advantage.—Applications to Dept. C.P.S., 336-7 Strand, W.C.2, quoting ref. 1024A. [1397

PRECISION engineering. The Instrument Design Group of The English Electric Co., Luton Division, is being expanded and the services are sought of a senior designer to head up the unit. The work involves design and development of high precision equipment, such as gyroscopes and similar precision equipment, to be used in conjunction with the guided weapons development programme. The position holds considerable responsibility and will be covered by an appropriate salary. Applications from qualified engineers for other positions in this group will also be welcomed.—Applications, quoting Reference 1142C, to Dept. C.P.S., 336-7 Strand, W.C.2. [1435

SITUATIONS VACANT

A LARGE COMPANY invites applications from Process Planning and Time Study Engineers for its Rotherham Division. The factory, which is a new one, produces aircraft preformed wiring sets and is rapidly expanding. Successful applicants have excellent chances of promotion. Applications in writing, quoting qualifications and experience in chronological order, to Box 2562. [1465

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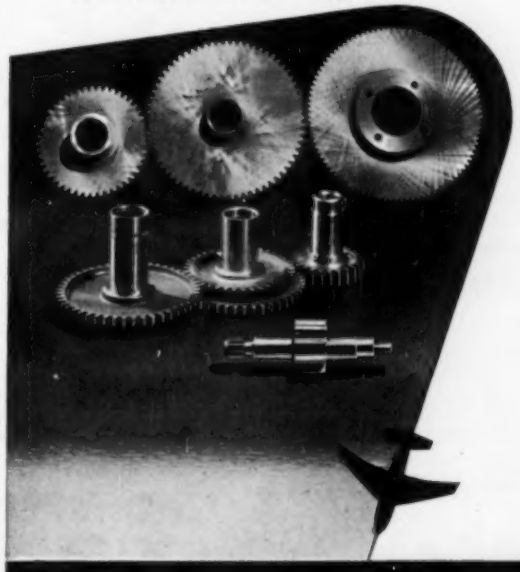

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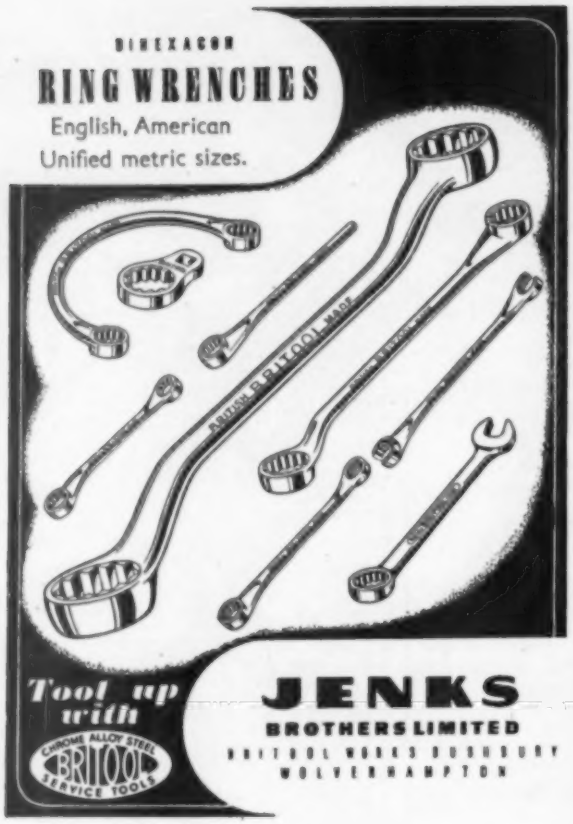

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